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DUNGLISON'S PHYSIOLOGY.

CAREY, LEA & BLANCHARD have lately published a second edition of *Human Physiology*, illustrated by numerous engravings. By Robley Dunglison, M. D., Professor of Physiology, Pathology, etc. in the University of Virginia, (now of the University of Maryland,) member of the American Philosophical Society, etc. in 2 vols. octavo.

This work, although intended chiefly for the professional reader, is adapted to the comprehension of every one, the anatomical and other descriptions being elucidated by wood cuts, and by copperplate engravings. It comprises a full investigation of every function executed by the various organs of the body in health, and is calculated to convey accurate impressions regarding all the deeply interesting and mysterious phenomena, that are associated with the life of man—both as an individual, and a species—and a knowledge of which is now regarded indispensable to the formation of the well educated gentleman.

"It is the most complete and satisfactory system of Physiology in the English language. It will add to the already high reputation of the author.—*American Journal of Medical Sciences*.

"A work, like this, so abounding in important facts, so correct in its principles, and so free from errors arising from prejudice to favorite opinions, will be cordially received and extensively consulted by the profession, and by all who are desirous of a knowledge of the functions of the human body, and those who are the best qualified to judge of its merits, will pronounce it the best work of the kind in the English language."—*Silliman*.

"This is a work of no common standing; it is characterised by much learning and research, contains a vast amount of important matter, and is written by a scholar and a man of taste. We are inclined to think that it will be placed by general consent at the head of the systems of Physiology, now extant in the English language. Nor are we prepared to say, that, all things considered, its superior exists in any language. It has a character of its own, and is a true Anglo-American production, unsophisticated by gairish foreignism."—*Transylvania Journal*.

ELEMENTS OF HYGIENE.

On the Influence of Atmosphere and Locality; Change of Air and Climate, Seasons, Food, Clothing, Bathing, Exercise, Sleep, Corporeal and Intellectual Pursuits, etc. on Human Health, constituting Elements of Hygiene. By Robley Dunglison, M. D., Professor of Materia Medica, Therapeutics, Hygiene, and Medical Jurisprudence in the University of Maryland, etc. 1 vol. octavo.

"We can recommend this work to the public with the utmost confidence, as one of the best treatises we possess."—*American Medical Journal*.

"Professor Dunglison has displayed much judgment and ability in selecting and digesting his materials; and has furnished a better exposition of the elements of Hygiene, than can be anywhere found in the English language."—*North American Archives of Medical and Surgical Science*, for March, 1835.

"The extent and variety of the work are sufficient to embrace whatever is most material, as well to the health of communities as of individuals: and all the topics, numerous and multifarious as they are, are handled with learning, judgment and skill. The chief value of the performance (the highest, indeed, that it could possess) consists in its being *practical in matter*, and perfectly perspicuous in style and manner. * * Having felt ourselves justified in remarking, on a former occasion, that we considered Professor Dunglison's system of Human Physiology the best in the English language, it is gratifying to us to be able to say the same, now, of his 'Elements of Hygiene.' We know of no other work on the subject, which the English reader can peruse with equal advantage. * * We shall close this article by again very cordially commending the Elements of Hygiene to public attention.—*Transylvania Journal of Medicine*, Vol. 8, No. 4.

LATELY PUBLISHED IN BOSTON, AND FOR SALE BY ALL THE BOOKSELLERS,

A new Dictionary of Medical Science and Literature, containing a concise account of the various subjects and terms; with the synonymes in different languages; and formulæ for various official and empirical preparations, etc. etc. By Robley Dunglison, M. D., etc. etc. In 2 volumes octavo, containing above 1200 pages.

GENERAL
THERAPEUTICS,
OR,
PRINCIPLES OF MEDICAL PRACTICE;
With Tables
OF THE
CHIEF REMEDIAL AGENTS, AND THEIR PREPARATIONS;
AND OF
THE DIFFERENT POISONS AND THEIR ANTIDOTES.

BY ROBLEY DUNGLISON, M. D.

PROFESSOR OF THERAPEUTICS, MATERIA MEDICA, HYGIENE, AND MEDICAL JURISPRUDENCE
THE UNIVERSITY OF MARYLAND; FORMERLY PROFESSOR OF PHYSIOLOGY, PATHOLOGY,
OBSTETRICS, AND MEDICAL JURISPRUDENCE IN THE UNIVERSITY OF VIRGINIA;
ONE OF THE PHYSICIANS TO THE BALTIMORE INFIRMARY, ETC.

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Lectures

DELIVERED BY HIM

IN THE

MEDICAL DEPARTMENT

OF THE

UNIVERSITIES OF VIRGINIA AND MARYLAND,

THIS WORK IS RESPECTFULLY INSCRIBED.

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ABBREVIATIONS, ETC.

IN the Tables, aa means *ana*---of each; f. prefixed to *dr.* or *oz.*, means *fluid*---a fluid
 drachm; a fluid ounce: *gr.* means *grain*; *gtt.*, *gutta*---a drop; O, *octarius*---a pint; m.
minimum---the sixtieth part of a fluid drachm; p. *pars, partes*---as, p. æ., *partes æquales*
 ---equal parts.

At page 33, opposite the second bracket, insert the word *Sedatives*.

GENERAL THERAPEUTICS.

CHAPTER I.

GENERAL PRINCIPLES.

Therapeutics defined—Instinctive action of recuperation—Importance of bearing it in mind in the treatment of disease—Cure by sympathy—Expectant medicine—Efforts of nature—Crises—Medical experience—Science of medicine demonstrative—Pre-eminence of Therapeutics—Therapeutical indications vary with Medical theories—Necessity of discovering the pathological lesion—Rational Therapeutics founded on rigid physiologico-pathological deduction—Importance of discovering the cause of the lesion—Etiology obscure.

THERAPEUTICS is the branch of Medical Science, which comprises the doctrine of the management of disease. Generally, however, the term is restricted to a description of the *modus operandi* of medicines; and the department is commonly associated, in our Institutions, with *Materia Medica*; whilst the Practice of Physic is confided to a distinct Professor. Under this division Therapeutics is made to embrace the general principles of medicinal administration, and the indications, which the different articles of the *Materia Medica* are capable of fulfilling, whilst the Chair of Practice is appropriated, so far as regards Therapeutics, to the application of those principles to particular morbid conditions. It is the business of the physiologist, to investigate the functions of healthy man: the pathologist regards those functions in disease, and the Therapeutist endeavours to restore them from the latter to the former condition.

There is no branch of medicine with which the Therapeutist ought not to be acquainted. To be a good Therapeutist requires not only that the individual shall have had extensive opportunities for witnessing disease, but also that he shall have read ex-

tensively the recorded observations of others. It demands, too, the utmost powers of discrimination;—hence the varied knowledge, which the physician ought to possess, and the learning and dignity of the science.

It might be imagined, that lectures on 'Therapeutics are unnecessary, where the mode of managing individual diseases is given from the Chair of Practice; in the latter case, however, the principles are necessarily diffused—not sufficiently embodied—and, moreover, the teacher generally presumes, that the student—which rarely happens—is imbued with the great principles and rules, that apply to the administration and *modus operandi* of medicines.

In the state of health the various functions are executed in a regular and harmonious manner, and are intimately connected by consent or sympathy; but if a morbid cause impresses the organism, this harmonious condition is disturbed; a fresh series of actions results; and confusion supervenes on the pre-existent harmony.

Physiologists have noticed in every living body an instinctive action—an action of the living principle, whenever manifestly directing its operations to the health, preservation, or reproduction of a living frame, or of any part of it. This applies to the plant as well as to the animal. It is the *vis medicatrix naturæ*, for and against which so much has been said; but which—if restricted to the operation we have mentioned—can no more be denied than the existence of life, of which we know nothing except by its results. This power is strikingly witnessed in the reparatory power exerted by living bodies after the receipt of an injury. If we tear a branch from a tree, we find that the injury done to the parent trunk is repaired, by an action analogous to that set up by the animal whenever a wound is inflicted upon it. In some vegetables, the reparatory power is so energetically exerted, that the lost parts are restored; and it is upon this power that the utility of some of our garden vegetables—spinach, parsley, cress, &c.—reposes. Such a reparatory power is occasionally—but rarely—met with in the animal kingdom. We see it in the lobster deprived of its claw, and in the serpent that has lost its tail. The nails and hair, too, regain their accustomed length when cut, and the same thing happens to the teeth of the Rodentia or gnawers.*

* See the Author's 'Human Physiology,' First Edit. ii. 491; and Second Edit. 1835, ii. 527.

Few animals, however, possess the power extensively of restoring lost parts ; but all are capable of repairing injuries when within due limits ; and, to a certain extent, of removing disease. In cases of wounds, and broken bones, the efforts of the surgeon are chiefly restricted to keeping the parts in apposition, and to preventing the intrusion of internal or extraneous irritants, whilst his reliance is placed in those sanative powers that are seated in the wounded part, as in every part of the living frame.

It is to this power, that we ascribe all the properties, assigned to the cure by sympathy, which, at one time, excited so much attention, was promulgated by the Rosicrucians, and obtained universal credence in the seventeenth century. This consisted in applying dressings, in the case of wounds, not to the injured parts, but to the weapon that inflicted them. The sympathetic powder of Sir Kenelm Digby was an application of this nature, which enjoyed the most astonishing reputation. It was first employed at Florence in the commencement of the seventeenth century by a Carmelite monk, who had just returned from India. The Grand Duke, hearing of the monk's marvellous cures, asked him for his secret, which he refused, fearing that the Duke would divulge it. Sometime afterwards, Sir Kenelm Digby, having rendered an important service to the monk, the latter, out of gratitude, communicated to him the composition of the powder, and Sir Kenelm took the secret with him to England. An opportunity soon occurred for testing its properties. A Mr. Howell, having been wounded in attempting to separate two of his friends, who were engaged in a duel, was subjected to its employment. Four days after the infliction of the wound, Sir Kenelm dipped one of Mr. Howell's garters in a solution of the powder, and immediately—it is asserted—the wound, which was previously painful, became easy, but as the garter grew dry, the pains returned, and were relieved by a fresh immersion of the garter in the solution. In five or six days, the wound healed. James the First ; his son—afterwards Charles the Second ; the Duke of Buckingham, and all the principal personages about the court were acquainted with the circumstances of the case ; and James—whose enthusiasm was not counterbalanced by much judgment, and who was, withal, superstitious in the highest degree—obtained the secret from Sir Kenelm, and himself performed most astonishing cures. In no great length of time

the composition transpired, and as in all like cases, the charm evaporated with the disclosure.* The powder, employed by Sir Kenelm, is asserted to have been the sulphate of copper, prepared in a particular manner. Some affirm it to have been the ordinary green vitriol of commerce.

The sympathetic ointments, applied to the weapon, or the 'armatory unguents,' as they were termed, are of various characters, containing the most absurd, disgusting, and often inert ingredients. The following extract from the *Sylva Sylvarum*, or Natural History of Lord Bacon, strikingly exhibits this. The mode of managing the wound itself sufficiently accounts for the good effects ascribed to the cure by sympathy.

"It is constantly received and avouched, that the anointing of the weapon that maketh the wound will heal the wound itself. In this experiment, upon the relation of men of credit, though myself, as yet, am not fully inclined to believe to it, you shall note the points following: First, the ointment, with which this is done, is made of divers ingredients; whereof the strangest and hardest to come by are the moss upon the skull of a dead man

* Dryden alludes to the superstition more than once in his "*Tempest, or Enchanted Island*." Thus;—ARIEL:

"When I was chidden by my mighty lord,
For my neglect of young HIPPOLITO,
I went to view his body, and soon found
His soul was but retired, hot sallied out:
Then I collected
The best of simples underneath the moon,
The best of balms, and to the wound applied
The healing juice of vulnerary herbs.
His only danger was his loss of blood;
But now he's waked, my lord, and just this hour
He must be dress'd again, as I have done it.
*Anoint the sword, which pierced him, with this weapon salve, and wrap it close
from air, till I have time to visit him again.*"

Act v. scene 2nd.

And:—MIRANDA, when she enters with HIPPOLITO's sword wrapped up.

"Hip. O, my wounds pain me!

(*She unwraps the sword.*)

"Mir. I am come to ease you.

"Hip. Alas! I feel the cold air come to me:
My wound shoots worse than ever.

(*She wipes and anoints the sword.*)

"Mir. Does it still grieve you?

"Hip. Now methinks there's something
Laid just upon it.

"Mir. Do you find no ease?

"Hip. Yes. Yes: upon the sudden all this pain
Is leaving me—Sweet Heaven, how I am eased!"

Act v. scene 2nd.

It is likewise referred to in the third Canto of the "*Lay of the Last Minstrel*" of Sir WALTER SCOTT.

unburied, and the fats of a boar and a bear killed in the act of generation. These two last I could easily suspect to be prescribed as a starting hole, that if the experiment proved not, it might be pretended, that the beasts were not killed in the due time; for as for the moss, it is certain there is great quantity of it in Ireland, upon slain bodies, laid in heaps unburied. The other ingredients are, the blood-stone in powder, and some other things, which seem to have a virtue to staunch blood; as also the moss hath. And the description of the whole ointment is to be found in the chymical dispensatory of Crollius. Secondly, the same kind of ointment applied to the part itself worketh not the effect, but only applied to the weapon. Thirdly, which I like well, they do not observe the confecting of the ointment under any certain constellation, which commonly is the excuse of magical medicines when they fail, that they were not made under a fit figure of heaven. Fourthly, it may be applied to the weapon, though the party hurt be at a great distance. Fifthly, it seemeth the imagination of the party to be cured is not needful to concur; for it may be done without the knowledge of the party wounded; and thus much has been tried, that the ointment, for experiment's sake, hath been wiped off the weapon, without the knowledge of the party hurt, and presently the party hurt has been in great rage of pain, till the weapon was re-anointed. Sixthly, it is affirmed, that if you cannot get the weapon, yet if you put an instrument of iron or wood, resembling the weapon, into the wound, whereby it bleedeth, the anointing of that instrument will serve and work the effect. This I doubt should be a device to keep this strange form of cure in request and use, because many times you cannot come by the weapon itself. Seventhly, *the wound must be at first washed clean with white wine, or the party's own water; and then bound up close in fine linen, and no more dressing renewed till it be whole.* Eighthly, the sword itself must be wrapped up close, as far as the ointment goeth, that it taketh no wind. Ninthly, the ointment, if you wipe it off from the sword and keep it, will serve again, and rather increase in virtue than diminish. Tenthly, it will cure in far shorter time, than ointments of wounds commonly do. Lastly, it will cure a beast as well as a man, which I like best of all the rest, because it subjecteth the matter to an easy trial."

The lines, in the above quotation, marked in Italics, are the key to the solution of the whole mystery. It is, indeed, the practice, adopted at the present day, in the treatment of incised wounds, and to this—not to the influence of the sympathetic

powder, or armatory unguent—it need hardly be said, must the main curative agency be ascribed, whilst a portion may be assigned to the mental revulsion produced on the sufferer, through his faith in the virtues ascribed to the application. The wound was carefully defended from the irritation of extraneous substances, and given up to that instinctive principle, which, we have seen, repairs the injuries to which organized bodies are liable; and it has been suggested that the results furnished the first hint that led surgeons to the improved practice of healing wounds by what is technically called—the ‘first intention.’

The existence, then, of such an instinctive power can neither be denied nor lost sight of in the treatment of disease. The error has been, that undue weight has been attached to it, so that the practitioner was altogether guided by its manifestations—or fancied manifestations—in laying down his indications of cure; and if no such manifestations appeared, he waited vainly—and too often most unfortunately—until the time had perhaps gone by for the administration of efficacious agents. To this system of ‘waiting, or expecting’ the term *medicina expectans*—*la medecine expectante*—was appropriated. The followers of Stahl—the great apostle of this doctrine—supposed a power to exist in the system of repelling morbid causes, and of re-establishing equilibrium when disturbed. There are but few cases, however, in which this power can be safely trusted to. It too often happens, that the diseased action in an organ goes on augmenting, until the functions of other organs become deranged by sympathy, and disorganization and death follow. Yet the doctrine of Stahl is still maintained by many practitioners—of the old world more especially; and, by many who reject it, terms are frequently employed, which may be regarded as its relics. How often, for example, do we not hear of ‘efforts of nature’ yet how unprecise the ideas attached to the expression. If a diarrhœa should supervene about the favourable termination of a protracted fever, it is looked upon as ‘critical;’—as a *bénéfice de ventre*, or a *bénéfice de la nature*; but if, on the other hand, diarrhœa supervenes in phthisis pulmonalis, as an accompaniment of the hectic fever, proves colliquative, and hastens dissolution, we hear nothing of its being an effort of nature to disembarass the economy—nothing of its constituting a crisis. If, again, an individual has suffered under headache, giddiness and other symptoms of uneasiness about the head, and epistaxis takes place, after which the symptoms are removed or mitigated, the hemorrhage is regarded as an effort of nature, although it was

doubtless dependent upon the same pathological condition that gave rise to the headache and other symptoms; but if the hemorrhage occurs to such an extent as to excite alarm, or to prove fatal, we hear nothing of an effort of nature. In the same manner, if hemorrhage occurs in the brain or in the lungs we rarely or never hear this explanation invoked.

Yet, although we may discard the notion of efforts of nature, there is no doubt, that good occasionally results from spontaneous discharges, and that, at other times, their supervention indicates a change in functions which have been long disordered, and a restoration to their healthy condition. Thus, where polylæmia or plethora exists in the vessels generally, or in some parts of the economy, the occurrence of moderate hemorrhage may diminish the intensity of the cause; and diarrhœa, or perspiration supervening in a fever of some duration, in which the functions of secretion have been morbidly implicated, may indicate that the organs of secretion are assuming a new condition, and that the morbid catenation, previously existing, is beginning to disappear. Although, therefore, we may not be justified in regarding such discharges as indicating any effort of nature, they may, doubtless, frequently be salutary.

An attention to these topics will lead us to combat irregularities when they occur in the organic actions, provided they are beyond the due point; and, at the same time, not to interfere too much with the instinctive actions, provided they seem to be going on favourably. The Therapeutist must be guided, however, by observation and reflection as to his rule of conduct in any particular case. In the very complex operations of the animal frame, the relation between cause and effect is not readily appreciable; great caution is, therefore, necessary on the part of the observer lest, in the place of *facts*—properly so called—he should register such as have been termed—not inappropriately—‘false.’ Should this be the case, owing either to the intrinsic difficulty of the subject, or to the incompetency of the observer, a foundation may be laid for other erroneous observations and deductions, and experience may in this way be acquired, but it is experience, in its sequel, most unfortunate. The public are, unhappily, too apt to be led away by this idea of experience; believing that all are capable of profiting by it, and, consequently, that every one who has been sufficiently long engaged in the pursuit of his profession must necessarily be experienced and wise. Were all men equally attentive and equally gifted with adequate powers of observation and reflection, the deduction would be just; but this is by no means

the case. If a man cannot observe and reason on topics of general physics—indeed, on general topics—he cannot on medical topics; and, accordingly, the best rule for estimating the abilities of the physician by the unprofessional, is by examining into the character of his mind, his modes of reasoning, his degree of mental application, and his general qualifications. A man of ordinary mind, application, and attainments may register a few facts; and, by comparing them together, may deduce useful inferences so far as these facts may permit, and in this way he may prescribe sufficiently well in ordinary cases; but such cases are not the touchstone of knowledge. In the multitude of trying cases that present themselves to every practitioner, in the course of his career, what painful anxiety is felt by him, if he be well informed in his profession, and, withal, a philanthropist! What careful comparison of his own experience with the recorded experience of others! What an amount of physico-moral reflection before he decides! Perhaps in no other profession or calling are the intellectual and moral feelings so much enlisted; but what consolation awaits the physician, when he can feel satisfied, that the result, at which he has arrived, accords with the demands of the case,—that the decision is adequate to the emergency. These are cases in which ignorance is bliss, but how fearful the responsibility of such ignorance! Views, like these, have given occasion to legislative enactments—which are every where too inoperative—to protect the public against the ignorant, the mercenary, and the—too often—unprincipled pretender. The curriculum of study, required in the different Medical Colleges, has been suggested by a wise care for the lives and the health of the public, and such a period of attendance upon the lectures that constitute it has been prescribed, as may enable the industrious—even if not highly gifted—to qualify themselves for entering upon the broad field of observation, and of extended usefulness into which their avocation may carry them. It is within collegiate walls, that the student acquires the prominent facts of his profession, and the great principles appertaining to its practical administration. He there learns the theory, on which all sound and rational practice is based. Too often, amongst the uninformed, the theoretical and the practical pursuit of a calling are placed in unworthy contrast. In no art can sound practice exist without theory. Theory is the mental process, which binds observed facts together; compares them with each other, and deduces appropriate rules of practice. Very different is this from the hypothesis that emanates from assumptions not proved.

It is to theory—as above defined—and as it is now understood every where amongst the scientific, that we are indebted not only for full practical usefulness, but for every science. Facts are, doubtless, the elements of science, but the science itself does not exist, until these facts have been brought together, sifted and compared, and great general principles deduced therefrom.

In such sifting and comparison, a multitude of miscalled facts have to be discarded. In the science of medicine—in every science—those that merit the epithet of false are numerous, and many of them rest on the authority of the heedless observer, who arrives at his conclusions without due examination. The theoretical investigation of science renders a man cautious even to scepticism. Very few, therefore, of the mass of recorded facts originate with him: he has little to do in accumulating the chaff that envelopes the grain. The records of the Patent Office of every country tend to elucidate this matter. It has been properly observed, that every patent is a speculation. Who, then, are the great speculators? Not the theoretical men, in the sense in which we have used the term, but what are called practical men,—men, who narrow themselves down to observed facts in their own profession or calling, and who, in consequence of their ignorance of theory, soon find that their inventions are no important additions to existing knowledge. A writer on this subject asserts, that he has made a rough estimate of the number of scientific persons who have published works relative to new inventions in arts, and he finds, that in Europe they did not exceed two hundred during the whole of the last century, whilst there are not fewer than that number of patents taken out in England annually. An adequate acquaintance with scientific truths would prevent this waste of time and of talent; and hence it is, that in every science or art, a combination of theoretical and practical knowledge is necessary to lead to lofty and enduring results. This is the great improvement in the modern method of teaching the practical sciences. That, which was formerly oracularly delivered from the chair as the result of the experience of the master, is not now promulgated as a matter, which is indisputable. It is placed before the inquirer as a fact, over and over again examined and scrutinized, and the reasons for any opinion are fairly stated as elements for his decision. The time has passed away—never to return—when the human mind is to credit the mere *verba magistri*, or to place implicit credence in a scientific assertion, without examination, because it proceeds from this or that individual. The rule of

conduct, implied in the language of the Roman Satirist,—‘ Marcus dixit, ita est ’—

“ Did Marcus say ’twas fact? then fact it is :
No proof so valid as a word of his ”—

has been too much inculcated in all ages, and no science has suffered so much from it as medicine. It has been properly remarked by Dr. Abercrombie, in his “Inquiries concerning the intellectual powers and the investigation of truth,” that in receiving facts on the testimony of others, we require to be satisfied not only of the veracity of the narrators, but also of their habits as philosophical observers, and of the opportunities which they have had of ascertaining the facts. In receiving affirmed truths, therefore, the inquirer has to exercise caution ; but at the same time to be careful lest by attempting to avoid one error he may incur another, and may pass from credulity to ill-judged scepticism,—extremes, which the mind, anxious after truth, will carefully avoid.

In the management of disease it is not always necessary that drugs should be given, unless their use is clearly indicated ; or unless in certain nervous and impressible individuals, whose faith is not reposed in any system of medication, that does not include the use of internal medicines. To obtain this faith is an important desideratum, as we shall see hereafter, in the treatment of many diseases, of a nervous character especially.

The physician exhibits his skill better by controlling disease by appropriate regimen than by administering combinations of whose effects he often knows little, and where much of his practice must necessarily be involved in conjecture. The science of medicine is more demonstrative than is usually imagined, and, where the case is not so, the practitioner had better do nothing. Any experiment may have one of two opposite results : it may do *good*, or it may do *harm* ; and a practitioner is not justified in administering a powerful medicinal agent at random. If he be desirous of instituting experiments, he ought to take example from some recent Therapeutical inquirers in Germany, and make them upon himself, rather than upon his patients. It cannot often happen, however, that the physician is at a loss what to do. His physiological and pathological knowledge will indicate what ought to be the great principles of management ; and his acquaintance with the remedial virtues of the different articles of the *materia medica* will suggest the proper agents for carrying those principles into due effect.

To elucidate this, let us take the case of the drug opium. I know that it will allay irritation, and produce sleep; a knowledge accidentally acquired. I know, also, that in a large dose it acts as a sedative; in a small dose, as a stimulant. When a case of inflammation occurs, I am not deterred from its use, because it excites in a small dose, but I give it in a quantity sufficiently large to insure the sedative operation. Accordingly, analogy has led to the employment of this useful drug in cases where the practitioner, a few years ago, would not have ventured upon it.

It is by empirical trials, that we become informed of the properties of any medicinal agent, after which sound physiological and pathological knowledge must suggest its correct application.

The great object of the science of medicine is to remove disease. Hence the pre-eminent importance of Therapeutics. It has been largely modified by prevalent systems or doctrines, yet it bends less to theory than any other branch of physic, and, accordingly, many of the different sects, which have existed from time to time, have been overthrown by this great test of their validity or weakness. In the closet a consistent scheme may be formed on paper, but when it comes to be applied clinically, it is often found to fail. It is obvious, that, *cæteris paribus*, Therapeutics should be the touchstone of medical skill: the number of cures ought to decide the qualifications of the practitioner; but it is so extremely difficult—nay, impossible—to estimate all the deranging influences;—so many modifying circumstances are perpetually occurring, that we cannot decide that any two cases are precisely identical. Hence we can never judge of the comparative success of different practitioners, on which so much stress is placed—and placed erroneously—by the public. Owing to these difficulties also, we have such a diversity of sentiment regarding the treatment of the same affection.

It is the Therapeutical *indications*, that vary so much with medical theories. By indication is meant—the end to be had in view in the administration of remedies. If we take a case of polyæmia or fulness of blood, the indication is obviously to diminish the amount of the circulating fluid, and bleeding is the remedy we have recourse to for fulfilling such indication.

Indications of treatment have necessarily been influenced by the dominant medical sect. The humorist or humoral pathologist, who looked to the fluids as the cause of all maladies, directed his attention to the removal of a fancied acridity, acidity, or

alkalescency of the humors, or to evacuate them after they had experienced a kind of maturation or preparation, which he called *concoction*. The mechanical philosopher attended to the permeability, or the contrary, of vessels; the effects of gravity and the like; and his indications were based upon his ideas on those matters. But these systems, and the Therapeutics founded on them, have passed away; not, however, without having left useful mementos of their existence; for it is obvious, that the conditions which they invoked cannot be wholly disregarded: the evil with those pathologists was, that they assigned to them too prominent a rank in the causation of disease, and that they attended to them to the exclusion of more important agencies.

One of the greatest errors in the investigation of disease, and its mode of management, is the belief which long existed, and which still exists with the mere routine practitioner, that it is only necessary to attend to symptoms, and to combat the most prominent as they occur. This is obviously insufficient without inquiring into the organ that is suffering, and the precise character of the existing derangement. The same symptom may be present in diseases of very different character; and before the Therapeutist can lay down any satisfactory indications of treatment, inquiry must be made into these circumstances, as well as to detect whether the mischief in the organ is primary or secondary, idiopathic or symptomatic;—in other words, whether the morbid mischief has commenced in the main seat of the disease, or has begun in some other organ or tissue, and extended to this by virtue of that sympathy which plays so important a part in every physiological, as well as pathological condition of the frame.

The insufficiency of attending simply to the more prominent symptoms may be elucidated by a few cases. A feeling of debility is a distressing symptom in the most inflammatory, as well as in the most enfeebling, disorder; yet how different the treatment! Itching of the glans penis is symptomatic of stone in the bladder. Itching of the nose, where the mucous membrane commingles with the skin, occurs in irritations of the lining membrane of the intestinal canal: in hepatitis, excruciating pain is occasionally felt at the top of the shoulder: painful retraction of the testis occurs in nephritis; and intolerance of light and sound are distressing symptoms of cephalitis; but it would be extremely unphilosophical to attend mainly to those prominent symptoms. The primary seat of irritation must be deduced from them, and from farther attentive examination; and it is not

until the physician has attained a thorough knowledge of the seat and nature of the disease, that a rational base can exist for his curative indications. The lesion of the affected organ must be appreciated. This is the point of departure for an enlightened practice. To resolve this question demands a careful inquiry into etiology, or into the causes of disease, and into physiological pathology. Not until this has been effected can obscurity be removed, and the practitioner determine properly on the indications that require fulfilment.

The fundamental object, in every indication, is to put a stop to, or mitigate the disorder in the organic actions, and to remove any alteration that may have supervened in the tissues consequent on such disorder. If inflammation, for example, takes place in any organ, the indication is, during the active stage, to remove the particular state of vessels, which constitutes the morbid condition, and if suppuration, induration, or any other of the terminations of inflammation should ensue, to have recourse to the appropriate remedies for the removal of the consequence. When once the primary organic lesion is removed, the symptoms occasioned by it will disappear, unless, as in the case of the terminations of inflammation, irritations—become independent of the primary affection—should persist, and give rise to a particular train of symptoms. The attention of the Therapeutist has, consequently, to be directed, in the first instance, to the primary lesion, and afterwards to the secondary or symptomatic.

The nature of the disease, then, or the precise species of vital modification of tissue, that gives occasion to the morbid phenomena, must be the base of every Therapeutical indication; and although the symptoms or manifestations may differ in the different ages and sexes, and according to the strength, &c., of the patient, the indications will be essentially the same: the treatment will rest on the same general principles, requiring modifications according to circumstances, but these constitute secondary considerations. Particular causes, seat, organization, &c., of the disease may suggest modifications of treatment,—may induce us to select one drug or combination, or one form of administration rather than another,—but the great indications will usually be identical, and the lesion, in all cases, must be regarded as virtually the same. In inflammation, for example, we may lay down the general rule, that the ordinary antiphlogistic remedies are indicated; and this, whatever may be the seat of the inflammation, or the strength, age, habit, &c., of the

patient; still, many modifications in the treatment may be demanded according to these various circumstances. I have said, that the ordinary antiphlogistic remedies are required, as a general rule, in inflammation. This morbid condition is, however, at times, extremely difficult of detection, in consequence of circumstances attending it, which are inappreciable except by experiment, and very frequently afterwards. To explain this, let us take the case of a blood-shot eye,—a state of the conjunctiva in which red blood is forced into vessels that previously conveyed only white blood. A grain of sand, or some extraneous substance, has excited irritation in the conjunctiva, and the consequence of this has been an afflux of fluids to the irritated part. In other words, the red vessels continuous with the white vessels have taken upon themselves augmented action; red blood has been sent into the white vessels, which are not intended to receive it in health, and these have become over-distended, so that, in the case assumed, there is an over-distended state of extreme vessel, and an over-excited state of the red vessel communicating with it.

This is a familiar and striking example: it does not, however, apply only to the white and red vessel, but to every case of inflammation, if we put the capillary or extreme vessel for the white vessel, and that communicating with the capillary vessel for the red vessel in the case assumed. Now, in this state of parts, it is manifest, that so long as the extreme vessel remains over-dilated, there will be more or less remora of blood in it—the circulation cannot proceed as uninterruptedly through it as through a capillary vessel, whose coats are in a condition of healthy tone: owing to this circumstance, excitement is kept up in the vessels immediately communicating with the over-distended extreme vessels, which excitement continues so long as such over-distension persists, and, in many cases, the irritation is extended from the parts first affected to the general sanguiferous system, until ultimately the heart and arteries are in a state of excitation and turmoil.

Now, a great difficulty in investigating the pathology of inflammation consists in our not always being able to discover, whether this atonic condition of the extreme vessel, induced by over-distention, or the over-excited state of the vessel communicating with it, is the condition which more especially requires attention: hence the difficulty of saying, in all cases, whether astringents or slight stimulants, or the opposite plan of treatment—the soothing—ought to be had recourse to. Every practi-

tioner meets with this difficulty, and, in cases of external inflammation, he is often compelled to resort empirically to one set of applications, and if it should not succeed, to have recourse to the other.

In certain textures of the body the predominance of over-distention of extreme vessel appears to exist, when they labour under inflammation, more commonly than in others. This seems to be the case with inflammation of the skin, and mucous membranes, which belongs to the variety of erysipelatous inflammation: whilst that of the cellular and serous membranes is of a more active cast, and may be regarded as appertaining to the phlegmogenous variety. Accordingly, in erysipelas, and in some of the inflammations of mucous membranes, remedies are occasionally had recourse to, which can rarely be employed in the other variety,—that is, in the inflammation of the cellular membrane, and of the serous membranes, for the latter obviously cannot be reached so that applications may be made immediately to them. Accordingly, in some varieties of burn, which consists of an erysipelatous inflammation of the skin, stimulating applications are found of service; whilst in others, where the excitement in the communicating vessels is inordinate, powerful antiphlogistic agents are demanded. Very recently, several cases of varied inflammation of the eye have been given, in which decided advantage was produced by dropping the essential oil of lemons upon the inflamed surface;* and, in most cases of chronic inflammation, the application of gentle excitants is found to be beneficial; accordingly, after gonorrhœa, for example, which is an inflammation of the lining membrane of the urethra, has continued for a long period, we attempt to arrest the discharge by astringent excitants, and if these are insufficient, the bougie is sometimes passed, to excite, by contact, the vessels to their healthy tone; and in this manner the gleet is often entirely got rid of, after it had resisted the continued use of ordinary antiphlogistics.

In all these cases—as in every other—rational Therapeutics must be founded on rigid physiologico-pathological deduction.

It is important in every morbid condition to inquire into the cause, that may have produced, or be producing, the phenomena. That this must always be removed, when practicable, is a self-evident indication. The maxim, “*Tolle causam cessat effectus*,” although often true, is not always so. If a thorn be run into the flesh, irritation will exist, so long as the thorn remains there; and, if it be removed, the recuperative powers of the part will

* Baltimore Medical and Surgical Journal. Vol. i. p. 478.

speedily repair the injury that has been inflicted. In the same manner, if a decayed, or loose tooth be exciting repeated gum-boils, the obvious remedy is to remove the tooth ; yet—as I have remarked—in the large mass of cases, although the cause, which immediately produced the disease, is taken away, the complaint will continue. A man, from a night's sojourn in a malarious district, may receive a sufficient dose of the exciting cause of intermittent fever to induce that disease, and although he may be removed from the unhealthy locality, the disease will persist after his change of residence. It may be said that, in this case, the malaria may still be present in the system, and this is possible ; but it is more probable—more consistent with analogy—that a morbid influence is exerted on the nervous system from this exposure, and that the effects go on, notwithstanding the abstraction of the morbid agent ; precisely in the same manner as a disease, produced by local irregularity of action in the capillary system, owing to exposure to cold and moisture, may persist, notwithstanding the removal of the morbid agent may have been complete. There is probably, at all times, a greater predisposition in the body to assume a diseased action in some particular organ or tissue than in another ; so that if irregularity of capillary action be produced in any external part of the organism, the mischief may not supervene in the part where such irregularity exists, but in the organ especially predisposed to assume a morbid action, through the extensive sympathy which exists between every part of the capillary system. Owing to this circumstance, the difficulty in discovering the precise cause of a disease is often extreme. Fortunately, the discovery is not a matter of moment, inasmuch as the disease usually continues independently of the cause ; and it is the disease—the modification in the structure or functions constituting the pathological condition—which we have to combat. In all cases, the patient is anxious to find out, and to suggest, a cause ; and the suggestions are frequently of the most unphilosophical character ; but although the practitioner feels this, it is unnecessary that he should show it.

This patient system of deduction and induction, will afford infinite satisfaction to the Therapeutist. By it he obtains precise ideas for his guidance, and excludes the blind empiricism, which has so long retarded the practice of medicine. To know the organ, and the disease under which it is suffering, is more than half the cure ; the selection of medicinal agents and their mode

of action then become beautifully and systematically clear. Experience—true observation—and sound reasoning join in the elucidation of the subject, and success—as much as the case will admit of—cannot fail to follow the exertions of the physician.

CHAPTER II.

CIRCUMSTANCES THAT MODIFY THE THERAPEUTICAL INDICATIONS.

Age—Sex—Original conformation—Habit—Climate—Mental affections—Professions, and Way of Life—Causes, seat, period, &c., of the disease.

HAVING briefly alluded to the great principles, that ought to guide the physician in laying down his indications of cure, we must glance at some of the chief circumstances, which contribute to modify those indications in the treatment of disease. In all cases, general principles are to guide the practitioner, but as we have to treat individuals, circumstances may be connected with them, which may demand important modifications.

The circumstances of a modifying nature are many. Some are connected with age, conformation, sex, professions, habit, &c.; others with the causes, seat, intensity, period, &c., of the malady.

1. *Age.* This has considerable influence, especially as connected with the different evolutions, which the system experiences at different times, so as to give occasion to diseases at one period of existence, which do not occur at others, and thus to modify both the rules of Hygiène, and Therapeutics.

In early infancy, there is great nervous susceptibility or impressibility, so that mischief is liable to be produced in the encephalon from slight irritations. On this account, the surgeon avoids performing any operation before and during the period of the first dentition, which he is not compelled to undertake. For the same reason, dentition itself is the cause of many phenomena of a sympathetic character, which can often be relieved

only by dividing the gum, and setting the tooth at liberty. Irritation in the intestines is also the cause of many morbid affections, and the same impressibility causes them not to bear narcotics well.

Again, under two years of age, large quantities of mercury may be given without the supervention of the ordinary effects of the medicine on the system. It is extremely difficult to salivate a child under two years of age, and yet at three, and afterwards, it is most easy. Here some singular evolutions must have occurred; some different condition of the absorbent function, which is inappreciable in the present state of our knowledge. The mortality at this period of existence is very great. One third of the whole number of deaths in our cities occurs under two years of age.*

In addition to the great tendency to disease of the cerebrospinal axis, we find, in summer, a disposition to erethism of the skin and mucous membrane of the bowels, and in winter to a similar condition of the mucous membrane of the pulmonary apparatus:—hence, cutaneous eruptions, aphthæ, diarrhœa, cholera, croup, bronchitis, &c., are common at this age, owing to the susceptibility to disease of the dermoid tissue; and convulsions, hydrocephalus (cephalitis) and other head affections, owing to the impressibility of the nervous system.

During the whole of this period, a predominance of acidity is manifested in the stomach, either owing to an undue secretion of the acids, met with in that organ in health, or to the re-action of the elements of the food on each other, or to both; and hence antacids are indicated, as well as occasional laxatives. The state of erethism in the mucous membrane of the intestines lays the foundation, in scrophulous habits, to mesenteric ganglionitis, and to consequent tabes mesenterica, in the same manner as a wound in the hand or foot lays the foundation to axillary or inguinal ganglionitis.

Between the age of the first dentition and puberty, including the whole of childhood, the liability to the affections, that were so fatal during the first two years of existence, becomes amazingly diminished; and the peculiarities of this early stage of existence gradually, and totally cease.

At, and after, the age of puberty a surprising change is observable. A complete revolution has been effected in the economy, by the development of the generative apparatus. The

* 'Elements of Hygiene,' p. 139.

morbid tendency is now to the lungs ; and consumption—that dread disease which is estimated to destroy one-ninth of mankind—is rife.

During the whole period of virility no particular modification is produced by the evolution of organs. All goes on with greater uniformity, so that no new morbid tendency seems to be developed. It is the standard period for all our physiological, and therapeutical descriptions, unless otherwise specified. If we speak of the dose of a medicine abstractedly, we mean the quantity usually needed by an adult male to procure the ordinary effects of the drug.

Lastly :—in old age, the nervous susceptibility becomes, in general, largely diminished, so that larger doses—of particular kinds of remedies at least—are needed, and a larger supply of food is demanded, in order that the enfeebled powers of chylolysis may be able to extract from it the adequate supply of chyle. The torpor of the intestinal functions is at times so great, that the excrement collects in large quantities in the lower part of the bowels, and it occasionally becomes so much indurated, that mechanical means,—as enemata, or the use of a scoop—are needed for its removal.

The tendency, too, to disease of the urinary organs, and especially of the prostate, and bladder, is considerable at this time of life, and but few individuals attain the age of eighty, without being more or less incommoded in this way.

Connected with the pathology of old age, Bégîn* has laid down the too general law,—that in the greater part of old people, disease is the result of chronic irritations, produced in the organs by the long continued repetition of the stimulations that accompany the regular exercise of the functions :—but this is improbable. We cannot readily conceive, how any continuance of healthy stimulations should bring on disease in these or other parts. In the exhausted condition of the nervous agency, obstruction or irregularity of action is apt to be induced ; and such obstruction, or any morbid deposition, dependent upon irregularity of action, thus becomes the source of irritation, and organic disease. All the morbid affections, indeed, of old age are irritative as at other ages. Chronic gastritis, ascites, enlarged liver, visceral engorgements ; chronic bronchitis in all its forms, asthma, angina pectoris ; chronic diseases of the heart in general :—all these are diseases of irritation, originating in some irregularity,

* *Traité de Thérapeutique. Tome i. p. 37.*

not in the simple continued healthy action of the organs implicated, or in debility.

At all ages, then, the treatment of disease must be, in its general principles, the same : but it requires to be varied according to the strength of the individual, and the evolution of the organs at different periods of existence.

2. *Sex.* Prior to the period of puberty, there are but few points of difference, so far as relates to our subject, between the two sexes. From organization there is a greater mobility and impressibility in the nervous system of the female, but this is not marked before she becomes nubile, or before the genital apparatus has experienced the evolution, which befalls it at puberty. After this, all the functions are apt to be modified by the condition of the uterine organs. A periodical discharge is established, and if this is in any manner interfered with, the organic irritation, which ought to have existed there, is transferred to other parts, and the one, most predisposed to take on morbid action, assumes it. Hence it is, that attention has always to be paid to the state of this function, when the Therapeutist is called upon to examine other functions that may be deranged, and may be obscurely connected with the uterine functions, through the extensive sympathy, which they maintain. This is signally manifested when the catamenia do not appear at the usual age ; or when, after having occurred regularly, they become obstructed. Whilst the catamenia, too, are flowing, the female is generally extremely impressible, so that active remedies—especially such as affect the lower part of the bowels, or the urinary organs, and excite the uterus through contiguous sympathy—have to be used with caution.

The period at which the catamenia cease is also one of interest to the Therapeutist. The female is then so proverbially liable to irregularity in the functions, and even in the nutrition of organs, that it has been called, even by the unprofessional—‘the critical period.’ Prior to their total disappearance the catamenia may recur irregularly ; chronic irritations may thus be developed in the sexual organs or elsewhere. The mammæ, having lost the sympathetic influence exerted over them by the uterus, are apt to assume a morbid condition, and to become the seat of irritations of a specific kind—as of cancer—which appeared to be previously held in check by the play of the healthy sympathies. Yet, although the female is more liable to disease at this time, it would not appear from the results of statistical inquiry that the mortality is increased.

It is obvious, then, that the state of the uterine function must

be an important object of inquiry in many of the diseases to which the sex are liable ; that when the catamenia are present, the secretion must not be officiously interfered with ; and if modified, either owing to the proper periodical irritation having been arrested, or to the flow occurring in too great quantity, measures—to be referred to hereafter—for altering these conditions, must be had recourse to.

At one time, it was universally presumed, that hysteria, is occasioned altogether by the state of the uterus, and hence its name, from *ἡστέρα*, ‘the uterus,’ and the German name—*mutter krankheit*, or ‘womb disease.’ It occurs, however, in man ; is essentially a disease of the nervous system, and probably prevails more in females only because they possess greater mobility, and irritability of the nervous system,—doubtless often developed by the particular condition of the uterine system reacting on the nervous system, but manifestly appearing—as in the male—where no such influence can be invoked.

The presence of the uterine system constitutes, therefore, the main difference in the indications to be laid down for the treatment of female diseases, as well as in the mode of fulfilling those indications ; and in all cases the Therapeutist has to carefully inquire, whether that system is primarily or secondarily affected. In many cases of functional aberration of the uterus, he will find, that the cause is seated perhaps in the state of the general system, or in some other part of the organism, although the case may be much complicated, in consequence of the reflection of the uterine irritation to other organs.

After all, the treatment of the majority of the diseases, that attack females as well as males, must be based upon the same great general principles. The chief modifying circumstance, to be borne in mind, being, that the female is more susceptible of impressions than the male, and consequently, as a general rule, does not require the same amount of remedial agent, although the same agents may be imperiously demanded. In managing those diseases that are of a sexual character, the same great modifying circumstance has to be recollected.

In the anomalies that occur at the commencement, or cessation of menstruation, the pathologist must be guided by his acquaintance with the laws of physiology and pathology, and establish his indications accordingly.

The state of gestation is a point, connected with the female, which demands consideration on the part of the therapeutist. The various sympathetic disorders, that may arise, have to be

palliated by the most gentle agents. The cause being seated in the gravid uterus cannot, of course, be removed, and palliation alone remains. No violent medicinal agents can be prescribed without hazard. Powerful excitants are especially noxious; and hence the hot bath cannot be used with impunity. Any thing, that interferes with the due nutrition of the fœtus in utero, or that can give occasion to uterine contraction, is obviously improper.

It is necessary, also, to bear in mind, that the blood of the pregnant female usually presents the buffy coat, or that appearance, which has been so generally regarded as the universal product of inflammation as to be called the ‘inflammatory crust;’ and it is still maintained by some, that this crust on the blood of pregnant females only appears, when inflammatory irritation exists. Certain however, it is, that we often witness it, when we have no other signs of inflammation.

When the crust occurs in inflammation, it appears to be owing to the vitality of the blood being exalted, so that it is longer in dying or coagulating, and time is thus allowed for the subsidence of the red globules to the bottom of the vessel. The fibrine, devoid of red globules, forms the upper crust or stratum, which is the buff. In like manner, we can understand, that under the new draughts, which are indirectly made from the maternal blood, during pregnancy, its vitality may be exalted, so as to give rise to the phenomenon in question.

As a general rule, the pathologist regards the appearance of the crust on the blood, as a strong proof of the presence of inflammation; and, when he would otherwise have remained in doubt, is encouraged, by this sign, to repeat his blood-letting. In pregnancy, such an inference from the appearance of the blood drawn would, for the reasons stated above, be erroneous. In many parts of this country, it is not unusual for a female to be bled five or six times during the period of pregnancy:—three or four times is very common; and if blood should not have been drawn and any unfortunate event should occur it is apt to be ascribed to a neglect of this fancied prophylactic. It is strange, that a process, which every one would readily admit to be natural in the animal, and to require no remedial means, should be regarded as a pathological condition. The notion has, however, been encouraged by some of the medical profession of no little celebrity, especially by Sauvages, who places pregnancy in the order *Intumescentiæ* of his nosology, and by Linnæus, who places it under *tumidosi* (morbi.)

During the period of nursing, the practitioner has to attend to another circumstance ; viz., that the action of his medicinal agents may not be confined to the female ; the infant at the breast may be affected likewise. Absorption is active, in consequence of the constant secretion from the mammæ, and certain substances may, therefore, be taken up, in sufficient quantity to affect the child injuriously.

3. *Original Conformation.* There are many circumstances connected with original conformation, which exert a modifying influence both hygienically, and therapeutically. Singular as it may seem, it is indubitable, that from the moment of a fecundating copulation, the new being is impressed with an impulse, which gives occasion to such a formation as may predispose the offspring, at some period of its existence, to a disease that affected the male or the female parent. In this way, a conformation may result, which may favour the development of consumption, apoplexy or scrophula, under the action of adequate exciting causes. Hence it is, that we find so much difference in the *constitution* of different persons. The constitution of an individual is nothing more than the organization proper to him ; and he is said to have a strong, or a delicate, a good, or a bad constitution, when he is apparently strong or feeble,—usually in good health, or liable to repeated attacks of disease. The varieties of constitution are, therefore, as numerous as the individuals themselves. A strong constitution, as I have said elsewhere,* is considered to be dependent upon a due development of the principal organs of the body ; on a happy proportion between those organs ; and on a fit state of energy of the nervous system ; whilst a feeble or weak constitution results from a want of these postulates ; but it is obvious, that our knowledge on this matter must be somewhat limited, although, by a careful examination, we may be able to appreciate or rather to approximate it.

We daily observe, in our intercourse with man, in a state of health, or disease, that some persons possess much more irritability or impressibility than others. This irritability or impressibility is mainly seated in the nervous system, and through it every tissue of the body may be affected, by virtue of the contractility or excitability, which it possesses, and which was at one time supposed to be a *vis insita*, seated exclusively in the muscles. There is no living texture—in the animal or vegetable—which does not possess it, and its properties are,—a power of feeling or

* 'Human Physiology,' First Edit. ii, 149. Second Edit. ii, 490, and 'Elements' of Hygiène,' p. 27.

of being acted upon or affected by a stimulus, and of moving responsive to such stimulus. Now, there is an obvious difference amongst individuals, as regards the extent to which their textures possess this sensibility and motility, which constitute excitability.

Men certainly have very different degrees of nervous energy; and great diversity in their susceptibility to impressions; and consequently great diversity exists in the degree to which they are predisposed to disease, and in the action of remedies. Persons of very great nervous susceptibility are sensibly alive to atmospheric vicissitudes; have the *Cænæsthesis*, or 'common feeling' (*gemeingefühl*) of the Germans, extremely acute; are languid, listless, and depressed in a lowering atmosphere; buoyant, and elastic, or 'corky'—to use the language of the trainers—when the air is dry and serene.

We see the same variety in the way in which powerful emotions, or powerful impressions on the senses, affect different individuals. Some persons faint on the slightest shock made on any of the senses; others are thrown into convulsions by causes, which, in others again, would excite no perceptible emotion. The over-excitement of a nervous individual concerns us materially, in the application and effects of our 'Therapeutical agents. With such individuals, the slightest cause may produce fever, owing to the irritation of the nervous system extending to the vascular system, and throwing it into augmented action. Usually, the febrile irritation, thus induced, is only ephemeral; but if there be any part of the capillary system, owing to obstruction, or morbid derangement, strongly predisposed to assume the inflammatory condition, such a condition may be induced by the force with which the blood is propelled by the heart and arteries. The circulatory system is not *directly* influenced by the brain or spinal marrow, but it is so *indirectly*. We see this in the effect of emotions. The heart leaps with joy; and under the influence of certain passions, its actions are hurried and unequal. Nay, the effect extends even to the small vessels,—to those whence the secretion is operated in the glandular system. At the sight of a cherished article of food, the salivary glands secrete so rapidly as to cause the 'mouth to water,' and the saliva to be projected from the mouth.

It is an important principle, not to be lost sight of in Therapeutics, that the condition of the circulatory system is largely influenced by that of the nervous system; and it is especially important to bear this in mind in the management of febrile and

inflammatory diseases. If blood-letting be pushed to a very great extent, in such cases, it will induce irregularity and irritability in the action of the nervous system, and in this way local determinations may be, and often are, induced by the very means employed to obviate them. This effect of copious loss of blood is strikingly and instructively exemplified in uterine hemorrhage. A female, after delivery, may be reduced to death's door by the profuse discharge of blood. She may be almost pulseless, pale, and exanguious; and yet, in the course of a few hours after she has rallied, the most violent determination may take place to the head—as indicated by intolerable cephalalgia and violent throbbing of the carotid, and temporal arteries;—a state induced by the irregularity I have described as apt to be engendered by that irritability of the nervous system, which follows a profuse discharge of blood. In a case like this farther blood-letting can obviously not be indicated. The irritability of the nervous system must first be allayed; and accordingly, I have found the most decided advantage from the use of opium administered in such a dose, and in such a form, as to ensure the speedy production of its full sedative influence. When this begins to be exerted, the activity of the cephalic circulation gradually yields; and in a short time the whole mischief disappears. If blood-letting be had recourse to in such a case,—even if to a moderate extent, and it could not well be otherwise in such a reduced state of the system,—it will be calculated to augment the very pathological condition which it was intended to remove.

The advantage attending a union of copious bleeding with sedative doses of opium can thus be readily appreciated. The abstraction of blood reduces the amount of stimulus in the sanguiferous system, whilst the opium keeps down the excitability of the nervous system.

In particular diseases, the nerves are remarkably susceptible to impressions. In neuralgia faciei, the slightest motion of the muscles—the slightest breath of air—will induce the most excruciating torment; and in hydrophobia the distress and horror are chiefly occasioned by the impression of certain objects on the organ of sight. Some persons, again, suffer much more from pain than others. This is the case with different animals, and it is equally so with different men. The idea, that the beetle, when trod upon, feels as much as the giant when he dies, is poetical, but probably untrue. Some persons are thrown into the greatest nervous distress—the most intolerable anguish—by

the application of a blister; and it is well known, that all do not bear surgical operations equally well. This is doubtless greatly dependent upon organization, although it may be modified by habits of endurance or the contrary. The state of the mind, as is well known, exerts a powerful influence in this respect. The religious fanatic, and the martyr to political excitement have exhibited resistance to physical agents—a degree of *inflexibility*, as Meiners calls it—almost incredible.

The condition of the nervous system can never be wholly disregarded by the Therapeutist. Whenever it is morbidly impressed, the operation of medicines is interfered with; and regular physiological actions may be importantly modified. We see this last effect strikingly exhibited in the case of the parturient female. Labor may be proceeding in the most favorable manner, but if any thing should interfere with the attendance of the practitioner who has been expected, and another should present himself; and, still more, if the latter should have an unprepossessing appearance, the pains will subside, and the delivery may be greatly retarded; whilst if the accoucheur, in whom the female had reposed her confidence, had presented himself, the termination might have been as much facilitated.

Dr. A. T. Thomson* gives the following anecdote as illustrative of the control of the mind over the operation of medicines, where the whole effect must obviously have been induced through the nervous agency modifying the functions of the organs concerned. A lady was laboring under an affection of the bowels, attended with severe pain and the most obstinate costiveness. She was bled; the warm bath, and fomentations were frequently resorted to; and purgatives and various anodynes were freely administered, but without the least effect upon the bowels, and without either sleep, or any diminution of pain following. At length, the physician in attendance was informed that she had expressed her conviction, that her usual medical attendant, who was in the country, alone understood her constitution, and was the only person who could relieve her. This gentleman was accordingly sent for; and although no change, either of measures, or of medicine, was resorted to, the bowels were quickly moved; sleep, and a cessation of pain followed, and in a few days the patient was convalescent. He further remarks, that he has often witnessed frequent illustrations of this influence of mind, in modifying the effects of medicines, in the

* ‘Elements of Materia Medica and Therapeutics,’ vol. i. p. 39. Lond. 1832.

treatment of gonorrhœa, contracted by married men; and also by young men, possessed of a high feeling of moral rectitude. The anxiety of such persons to be speedily cured occasions the mind to be constantly directed to the seat of the disease; and more or less erethism is thus induced, which renders the cure difficult. Dr. Thomson thinks, that 'a vascular fulness of the mucous membrane, and a state resembling chronic inflammation' are thus superinduced, which resist the influence of medicines, that would readily cure the disease in those in whom it was a matter of less anxiety, and little mental reflection.

It is obviously, therefore, of moment, in all affections, particularly in those of an inflammatory character, that the mind should not be permitted to brood over the malady; and that every endeavour should be made to withdraw the nervous influence from the part affected, so far as it can be done with propriety. It is in this way, that revulsive applications exert a portion of their beneficial agency. They not only excite the parts to which they are applied, so as to break in upon the morbid catenation elsewhere existing, but they attract the attention; and the nervous influx, which would otherwise be directed towards the suffering organ, is directed towards the part artificially irritated.

Much stress has been placed on the influence of temperament in a pathological as well as therapeutical point of view. The subject of the characteristics of the temperaments, usually admitted, belongs to physiology*. The *sanguine*; the *bilious* or *choleric*; the *melancholic* or *atrabilious*; the *phlegmatic*, *lymphatic* or *pituitous*, and the *nervous* are generally received and described by writers; but if we attend to their reputed characteristics, the imperfection of their definition, and demarcation is obvious, so imperfect, indeed, that it is very rare for us to meet with an individual, whom we could unhesitatingly refer to any one of them. They are likewise susceptible of important modifications from climate, education, &c., and may be so combined as to constitute innumerable shades. The man of the strongest sanguine characteristics may, by misfortune, assume all those, of a mental character particularly, which are looked upon as indexes of the melancholic or atrabilious; and the activity, and impetuosity, ascribed to the bilious temperament, may, by slothful indulgence, be converted into the lymphatic or phlegmatic.

* 'Human Physiology,' First Edit. ii. 446. Second Edit. ii. 436, and 'Elements of Hygiene,' p. 24.

All these temperaments acquired their names from a fancied predominance of certain systems, which so tempered the different functions as to communicate certain evident characteristics. In a therapeutical consideration, they do not demand much attention, except perhaps so far as regards the two opposite—the *sanguine*, and the *melancholic*; and perhaps the *nervous*.

The first of these is presumed to be dependent upon a predominance of the circulatory system; and hence is considered to be characterized by strong, frequent, and regular pulse; ruddy complexion; animated countenance; good shape, although distinctly marked; firm flesh; light hair; fair skin; blue eyes; nervous susceptibility, attended with rapid *successibilité* as the French term it,—that is, a facility of being impressed by external objects, and of passing rapidly from one idea to another.

On the other hand, in the melancholic temperament, the vital functions are considered to be more feebly or irregularly performed; the skin has a deeper hue; the countenance is sallow, or sad; the bowels are torpid, and all the excretions tardily accomplished; and the pulse is hard and habitually contracted.

In the nervous temperament, again, the susceptibility of being acted upon by external impressions is unusually developed. It is characterized by small, soft, and, as it were, wasted muscles; and generally by a slender form, and great vividness of sensation.

Such are the characters ordinarily assigned to these temperaments. Many of them are fallacious, and but few need be borne in mind in therapeutical investigations. As a general rule, it certainly would seem, that persons of strong sanguine characteristics have the nervous system more impressible; the body more predisposed to inflammatory action, and the vessels less protected by the tissues in which they creep, and hence they are more liable to obstructions, as well as to hemorrhage by rupture or transudation; and it is manifest that in such an organization antiphlogistics may be more demanded, and stimulants ought to be employed with more caution, than in the melancholic. Again, the possessor of the nervous temperament may demand modifications of management, both hygienically and therapeutically, which may not be suggested in those of any of the other temperaments. After all, however, we cannot deduce much instructive matter, for our practical guidance, from the study of this topic; nor do I conceive, that the doctrine of the temperaments in any of its relations—physiological or psychological—hygienical or therapeutical—is worthy of the

consideration that has been bestowed upon it. In Therapeutics the nature of the diseased action going on in an organ is our great object of study; and if our thoughts are distracted from this, and directed to temperaments or tendencies, we may often be greatly misled. Some years ago, I was requested to visit a lady, for the first time, in the absence of the regular physician, who had long attended her, and had become, what is called, 'acquainted with her constitution.' She was laboring under profuse metrorrhœa, which had continued for some time, and had completely prostrated her; she was deadly pale; lips blanched; pulse scarcely perceptible; and every evidence present, that the hemorrhage was not continuing from activity of vessels; or, at all events, that the idea of activity must be laid aside in the treatment, and the powers of life be supported, or otherwise she would sink. The uterus was in an unimpregnated state. The usual means with the tampon were adopted successfully, so far as regarded the immediate flow; and a tonic system of medication was recommended, under which the hemorrhage did not recur during the day. In the evening, the family physician arrived, who, finding her in a comfortable situation, and evidently improving, discontinued the tonics, under the apprehension, from his knowledge of her sanguine temperament, that violent reaction and consequent mischief might ensue; but in the night he was called up, owing to the alarming recurrence of the hemorrhage, and was glad to have recourse to the management, which had previously proved successful; under which she ultimately recovered, and since that period—nine or ten years ago—has had no return of the disease.

In this case, a 'knowledge of the constitution' was likely to have been attended with disastrous results. The diseased condition is, indeed, the only point to which our attention has to be directed; and it is the only one, that can, in general, fall under the personal observation of the physician, in the mode in which the profession is regulated in England. The apothecary is there the family-practitioner, and the physician is only called in consultation, so that the chief part of his practice must necessarily occur in persons, with whose constitutions he has had no opportunity of being previously acquainted.

Temperament is conformation, but *Idiosyncrasy*—or the peculiar disposition, which causes an individual to be affected by extraneous bodies, in a way in which mankind in general are not acted upon by the same agents—may be acquired, and when once it has been so, it is apt to continue, and frequently does so

throughout the whole of existence. I myself possess a singular idiosyncrasy of this kind. If a piece of thin biscuit, or oaten-cake, be broken in my presence,—nay, the idea alone is sufficient,—the muscles, that raise the left angle of the mouth, contract, and this irresistibly.

It is obviously of moment, that the practitioner should be acquainted with all idiosyncrasies or peculiarities, and so far the notion of ‘knowing the constitution,’—which is apt to be used to the prejudice of the young practitioner, or of any except the accustomed medical attendant,—carries reason with it. But it is the duty of the patient to put the practitioner in possession of the fact of such peculiarity, so that he may be enabled to guard against it, and not take that for morbid, which is the effect of simple idiosyncrasy.

By virtue of these peculiarities medicines will often produce effects diametrically opposite to those they ordinarily exert. I know a gentleman, whom opium purges, yet this drug is usually administered to check inordinate action of the intestinal tube. M. Chevalier gives the case of a lady, who could not take powdered rhubarb without an erysipelatous efflorescence shewing itself, almost immediately afterwards, on the skin; yet, what is singular again, she could take it in the form of infusion with perfect impunity. It is impossible for the physician to detect these peculiarities by any signs. His information has to be wholly derived from the patient. But when once acquired he is expected to retain it; and, strange as it may seem, I have known all confidence in the practitioner annihilated, because he did not recollect that oil of peppermint, or some other trivial agent, was in the habit of disagreeing with his patient. It was regarded as an evidence, that he did not attend sufficiently to the constitution, and the inference followed, that without this, his endeavours could not have secured the full amount of success, whilst his inattention might have been productive of bad effects, owing to the irritation that might have been induced by the development of this sympathy, in a frame perhaps already too much disturbed by morbid influences.

There are very few functions of the body that are altogether free from idiosyncrasies. An acquaintance of mine cannot be present where ipecacuanha is being powdered, without the most violent catarrhal symptoms being produced. The smell of the callicanthus is so disagreeable to another as to be almost intolerable. Pope Pius VI. had such an antipathy to musk, that on an occasion of presentation, an individual of the company having been

scented with it, his Holiness was obliged to dismiss the party almost instantaneously. These are idiosyncrasies or peculiarities connected with smells, which are agreeable to the generality of mankind. On the other hand, we find that, by some, offensive smells are preferred. I knew a lady, who always perfumed her snuff with assafœtida; and Louis XIV. is said to have preferred the smell of the urine of the cat to that of the rose. Some persons, again, cannot take peppermint,—with many, opium disagrees, producing the most intolerable headache, nausea, and vomiting,—and exciting no anodyne effect whatever. Dr. Tomson refers to the case of an individual, who was always attacked with syncope when he took the smallest dose of calomel. But the peculiarities of this kind are innumerable, and the practitioner ought to be put in possession of them, otherwise disagreeable results may take place; the economy may be disordered, or effects, opposite to those, which the article usually induces, may follow.

The different impressibility of the nervous system of different individuals is often exemplified in practice in the effect produced upon the circulation at the appearance of the physician. The pulse will often, in the delicate female, under such circumstances, be quickened 20 or 30 beats in the minute;—a fact which the physician should bear in mind, or he might ascribe that to disease, which is the mere effect of idiosyncrasy, or inordinate impressibility. In some persons, the pulse is unusually slow. The ordinary number of beats of Napoleon's was 44 in the minute; I knew one 36; and Lizzari refers to one, which did not number more than 10: but it is *possible*, that in this case there might have been intermediate beats, unperceived by the physician. On the other hand, some individuals have the pulse much quicker than ordinary. Seventy beats in the minute is about the average with the healthy male; but sometimes we find the number in health as high as 90 or 100. The pulse of the aged is generally slow and irregular, or intermittent, but it will occasionally be frequent and regular. A change of this kind has recently happened to a valued friend. Until about the age of 80, his pulse possessed the usual character appertaining to that of the aged; but, for the last few years, it has become quicker, beating nearly 90 in the minute, and is more regular than it was. During early childhood, the same intermittent and irregular character exists in health, but the pulse is faster than in the adult. As a general rule, at birth the number of pulsations is from 130 to 140; at one year, 120; at two years, 110; at

three years, 90; at puberty, 80; at the adult age, 70; and in old age, 60. In the female, the pulse is on the average from 5 to 10 beats quicker than in the male.

All these circumstances have of course to be borne in mind in investigating any case of disease. But owing to individual peculiarities, it becomes at times extremely difficult to pronounce upon the existence of a morbid condition from single symptoms;—as from the pulse; more especially from its degree of quickness or slowness, inasmuch as we are not always acquainted with the number of beats in a state of health. It is partly on this account, that Celsus termed it “*res fallacissima*,” yet, strange to say, it has even been made the ground of discrimination in a case of suspected insanity, and by an illustrious native of this country, whose transcendent abilities were too often obscured by his unbounded enthusiasm, and his too prolific imagination. In counterfeited insanity, Dr. Rush remarks, the pulse will be natural; in real insanity it is generally more excited than in a state of health; and this diagnostic Dr. Cooper has introduced in his collection of ‘*Tracts on Medical Jurisprudence*,’ as a fixed and invariable law; to which, at least, he has not attached any doubt or exception. “The knowledge of this fact,” adds Dr. Rush, “has once been applied with success in the administration of the criminal laws of the United States. One of the two men who were condemned to die for treason, committed against the general government in the western counties of Pennsylvania in the year 1794, was said to have lost his reason after sentence of death had been pronounced upon him. A physician was consulted upon his case, who declared his madness to be feigned. General Washington, then President of the United States, directed a consultation of physicians upon his case. Dr. Shippen, Dr. Samuel P. Griffiths, and myself were appointed for that purpose. The man spoke coherently upon several subjects; and for a while the state of his mind appeared doubtful. I suggested the propriety of examining his pulse—it was more frequent by twenty strokes in a minute, than in the healthy state of the body and mind. Dr. Shippen ascribed this to fear. I then requested, that the pulse of his companion, in guilt and fear, might be felt. It was perfectly natural in frequency and force. This discovery induced us to unite in a certificate, that the man, who was only supposed to be mad, was really so; in consequence of which his execution, as well as that of his companion, were suspended for two months; in which time the popular clamor for their

lives so far subsided, that they were both pardoned by the executive of the United States*.”

This is perhaps the *ne plus ultra* of philanthropy,—certainly not of science.

From all that has been said, it is manifest, that idiosyncrasy has much power in modifying the operation of medicines; and that it is consequently important for the practitioner to be aware of it; and it may not be amiss for him to make specific inquiries, where he wishes to administer such drugs as are apt to disagree with many individuals;—of which opium and its preparations, and calomel, are perhaps the most prominent.

4. *Habit*. By this we understand an acquired disposition in the living body, become permanent, and as imperious as any of those primitive acts, which have been also, in another sense, denominated *habits*.

When a function is over and over again exerted to the utmost extent of which it is capable, both as regards energy, and activity, or if it be exerted beyond the ordinary extent, it becomes more and more easy of execution; the organ is better adapted for its production; and, it may become so habituated to this over exertion, that a real want may be engendered,—a ‘second nature,’—and the individual may feel uncomfortable, unless the organ is subjected to the accustomed action. In the same way, by habit, the action of an organ may be diminished, until ultimately it is but little adapted for full action. The knowledge of these facts has led one of the most gifted and ingenious naturalists of the present time—M. De Lamarck—to affirm, that the habits of an animal are not dependent upon its organization; but that, on the contrary, its habits, mode of life, and those of its ancestors have, in the succession of ages, determined the form of its body, the number and condition of its organs, and the functions and the faculties it enjoys:—a position which he has supported with much plausibility, and at the same time with much, that approximates to the *reductio ad absurdum*: as, for example, where he invokes the case of the reptiles, which in his view, as well as other vertebrated animals, had originally, according to the great plan of organization, four paws attached to the trunk. Serpents must consequently have had four; but having assumed the habit of creeping along the ground, and of concealing themselves in the grass, their bodies, owing to perpetual efforts at elongation,

* ‘Lecture on Medical Jurisprudence, p. 322.

† ‘Philosophie Zoologique’ nouv. édit. i. 235.

to enable them to pass into narrow spaces, acquired an unusual length, in nowise proportionate to their thickness. Paws would have been quite useless. Long paws would have interfered with their creeping, and very short paws would have been but ill adapted for moving the body. Hence, the want of employment of these parts being constant, they gradually disappeared; although, says De Lamarck, they may have originally entered into the plan of organization of animals of their class.

But, although this distinguished naturalist carries the effect of function on organization to an extent, which cannot be maintained; it is certain, that the habitual exercise of an organ does add to its development, within certain limits; whilst inaction gives occasion to its impoverishment. We have this signally exemplified, if we restrict an animal to diet of a different character from that to which it has been accustomed; or to one foreign to its nature. In birds of prey, the digastric muscle—which is strong in the gallinaceous bird—has the bellies composing it so weak, that, according to Sir Everard Home, nothing but an accurate examination can determine its existence. But if a bird of this kind, from want of animal food, be compelled to live upon grain, the bellies of the muscle become so large, that they would not be recognized as belonging to the stomach of a bird of prey. Mr. Hunter kept a seagull for a year upon grain; after which he found the strength of the muscle greatly augmented. This wondrous adaptation of structure to the kind of food, which the animal is capable of obtaining, is likewise elucidated in the cases of the South American, and the African ostrich. The former is the native of a more productive soil than the latter; and accordingly the gastric glands are less complex, and numerous, and the triturating organ is less developed.

It is owing to the effect upon the body of long continued action, that old and inveterate habits cannot be suddenly broken in upon with impunity. Hence, issues, or other discharges must be gradually checked prior to total occlusion; otherwise the irritation, and consequent afflux may be directed to other and important organs, which may be, at the time, disposed to assume a morbid action.

In like manner, we cannot safely withdraw, at once, the accustomed stimulus, where a person has been in the habit of daily indulging in the unmeasured use of spirituous liquors or of opium. The nervous system, being habituated to stimulation, totters, if excitants be withdrawn, and delirium tremens, with all its horrors, almost surely supervenes. In times of spreading sickness,

such sudden and total change of inveterate habits, no doubt, adds greatly to the extent of the calamity. The drunkard becomes alarmed; abandons his stimulant; and, under the depression that follows, readily imbibes the morbid influence; and sinks a victim to incautious reformation.

The effect of medicines on the frame is much influenced by habit. As a general rule, continued use detracts from their power. This is strongly shewn in the case of opium. Dr. Thomson refers to instances in which two drachms, or one hundred and twenty grains of solid opium, or five fluid ounces of laudanum, have been taken in twenty-four hours; yet before the habit was induced these persons could not have taken as many grains without danger. But although this habit of endurance or resistance has been acquired in the case of opium, it does not follow that the system, thus rendered obdurate to it, will resist large doses of other narcotics. Notwithstanding these extraordinary quantities of opium may be swallowed with impunity, the same individual may be affected with considerable facility, provided another narcotic be substituted. In like manner, if a person has been habituated to the use of aloes as a cathartic, it may altogether lose its effect; yet if we change the special irritant, or, in other words, have recourse to another cathartic—castor oil, or sulphate of magnesia, for example—catharsis may be produced by an ordinary dose. It does not therefore follow, that the sensibility of the mucous membrane of the intestinal canal becomes blunted in these cases. It merely loses its impressibility as regards one irritant; whilst it may be equally susceptible of irritation from every other irritant of the class.

According to this general effect of habit, it would follow, that the second dose of a cathartic ought to be larger than the first, provided it be administered within such a period, that the influence of the first dose continues to be felt; and it is the usual practice with the physician to direct the after dose to be larger; but there are some cathartics, which appear to differ in their action upon the mucous surface with which they come in contact, so as to render it more impressible—many of the salines, for example. Such effect has long been ascribed to the Cheltenham water. It would seem, too, that the constitution, so far from becoming reconciled to lead by habit, is rendered more and more sensible to its irritation. Emetics also frequently act more powerfully by repetition. Dr. Cullen affirms, that he knew a person so accustomed to excite vomiting on himself, that the one-twentieth part of a grain of the tartrate of antimony and potassa was

sufficient to produce a convulsive action of the parts concerned in vomiting.

This difference in the effects of agents by repetition we observe in disease. In certain cases, after the system has been once morbidly impressed, it is ever afterwards unsusceptible of the same mischief; in others, it is less susceptible; whilst in others again, it is rendered unusually impressible. The last effect is signally observable in the case of miasmata—those at least which give rise to intermittent fever. A person, who has once suffered under a pernicious, or severe, or even ordinary intermittent, requires a less dose of the malaria to reproduce the disease, than was required to occasion the first attack; and, at times, the nervous system becomes so impressible, that a chill is experienced whenever the individual enters upon a soil, which is exhaling the miasm. Persons so extraordinarily impressible have, indeed, been used—strangely enough—to indicate the existence or non-existence of malarious exhalations in given localities. In the seventy-second number of the ‘Edinburgh Review,’ a writer pronounces several districts, surrounding St. James’ Park, in London, to be unhealthy, owing to such exhalations, as tested in the mode just mentioned;—an officer who had suffered at Walcheren being the *miasmometer*.

It may be laid down, then, as a general rule, that remedies lose their effect by habit; a fact often strikingly the case with tonics; yet if another be substituted for a day or two, and the former be afterwards resumed, it will produce all its previous effects. Although, however, this is the general rule, it admits, as we have seen, of numerous exceptions.

5. *Climate.* The capability of existing in all climates is one of the attributes of humanity. Yet man is considerably modified in his physical and mental characteristics by situation. The temperate zone appears to be best adapted for his full development; and it is there, that the greatest ornaments of mankind have existed, and that science and art have flourished in exuberance; whilst in the torrid regions, the sensibility is over-excited; physical and moral energy is obtunded; and the native of the temperate zone, who has entered them full of life and buoyancy, has quitted them, after a few years’ residence, listless and shorn of his proudest characteristics.* The frigid zone, on the other hand, is equally unfavourable to mental, and corporeal development; the sensibility being blunted by the rigors of the climate. But the effect of locality is perhaps most signally exem-

* ‘Elements of Hygiène,’ p. 51.

plified in the *crétin* and *goîtreux* of the Valais, and of situations at the base of lofty mountains in every part of the globe, as well as in the inhabitants of our low countries, who are constantly exposed to malarious exhalations, and bear the sallow imprint on their countenances. The whole of the circumstances connected with the causation of endemic disease exhibit the powerful influence of locality, in the way of morbid impressions; and the outward conformation of the natives of different countries is an equal exemplification of its physiological influence. It is owing to such climatic modification, that we are enabled to distinguish the Frenchman from the Spaniard, Italian and Portuguese, although belonging originally to the same great Romanic stem: as well as to discriminate the different branches of the Teutonic race—the German, Dutch, and the Scandinavian—from each other.

As regards the disposition to disease of particular organs, induced by climate, it may be laid down as a general truth, that hot climates dispose to bilious complications. The heat occasions erethism in the whole dermoid system;—hence diarrhœa, dysentery, cholera morbus, &c., dependent upon irritation or inflammation of the lining membrane of the intestines; and this irritation, being propagated by continuous sympathy along the biliary duct to the liver, that organ is excited, sometimes inflamed, and in this way disease of the liver becomes induced by the influence of caloric. The mode adopted at Strasburg and Metz, for enlarging the liver of the goose, is signally elucidative of this subject*.

On the other hand, in cold climates, there is a greater tendency to inflammation of the mucous membrane of the air passages; the irregularity in the cutaneous and pulmonary transpirations giving occasion to local excitement in the bronchial mucous membrane, which is not always restricted to that texture, but in favouring habits may extend to the substance of the lungs, so as to develope pulmonary consumption. Hence, the effects of change of climate—especially the removal from a temperate to a torrid region, or conversely—become an interesting topic of inquiry to the physician in a hygienic as well as therapeutical point of view. I have elsewhere shewn, that owing to the great nervous susceptibility induced by the heat of torrid climes, such climes are unfit for those that are predisposed to mania, and to head affections in general; whilst they are—*cæteris paribus*—the best that could be selected for such as are predisposed to

* ‘Elements of Hygiène,’ p. 49.

pulmonary consumption, although most fatal to the same class of patients when the consumption has become confirmed.

The circumstances, that modify the physiological and pathological condition of man, necessarily modify, also, the mode of fulfilling therapeutical indications which might seem to be obvious. The well-instructed physician readily detects those differences, otherwise it would be necessary, that every student should receive his education in the country where he has to practise his profession. The practitioners, who are destined to exercise their calling in British India, receive their education in the mother country, whilst Baltimore sends her alumni to practise in Maine, and in Louisiana, and indeed in every part of the globe to which the interests of the nation, or the thirst of gain leads the hardy and venturous citizen. The principles of the science are alike every where, and but slight observation is requisite to guide the properly instructed mind to the appreciation of climatic differences of every kind.

Climate has some influence, but not a great deal, in modifying the action of remedies. Dr. Harrison found, that narcotics produced more effect in Naples, than in England. He instances the extract of hyoscyamus, which, in doses of three grains, three times a day, at Naples, produced a temporary amaurosis, or nervous blindness, which disappeared and recurred on the alternate suspension and administration of the medicine. This was observed in two patients, who had often taken similar doses of the same remedy, in England, without any unpleasant result—an effect which Dr. Harrison refers to the increased nervous susceptibility or impressibility, induced by the warmer climate. It might be imagined, that a source of fallacy existed in the circumstance of the Italian extract being more powerful than the English; but in answer to this Dr. Harrison remarks, that the medicine, which he administered in Italy, was procured from London. The same gentleman found, moreover, as a general rule, that the doses of medicines, as ordered in England, were too large for the climate of Italy*. The rule indeed may be extended, and it may be laid down, that remedies act more powerfully, or produce the same effect in smaller doses in hot climates, owing to the greater nervous susceptibility of the residents in such climates. Still, to this there are numerous exceptions. In referring to this subject, Dr. Thomson remarks, that “it does not always follow, that the doses of medicines

* Dr. A. T. Thomson, lib. cit. i. p. 69.

require to be reduced in warm climates ; on the contrary, in India, a scruple of calomel and a grain of opium are frequently administered, and repeated at short intervals, after depletion in dysentery ;" and he adds,—what must amuse the residents of many of the malarious districts of this country, and especially of the banks of the Mississippi,—that "but few physicians would venture to prescribe this active remedy, in such large doses in this climate,"—in other words, in temperate climates.

The truth is, that the action of calomel is but imperfectly understood. The French speak with horror of the doses administered by the English ; whilst in some parts of this country they are equally surprised at the small doses in which it is employed in England. I well recollect the tone in which a distinguished French army physician spoke of the hardihood of the English physicians in prescribing three grain doses of calomel ; yet there are practitioners in this country, who have given it in the dose of one hundred, or one hundred and fifty grains ; and some have recourse to it by the tea-spoonful. These immense doses do not produce an increased purgative effect in an exact ratio with the dose. On the contrary two or three grains will, at times, be actively cathartic, whilst twenty may not produce more or as much effect. After bleeding, especially, absorption is active ; the calomel speedily attains the circulation, and is given off by the cutaneous exhalants, as is evidenced by the effect produced upon a gold watch worn by the patient. Such appears to be the effect of a very large dose, even when blood-letting has not been premised, whilst a small dose irritates—without there being the stimulus of quantity to induce its absorption—and has a cathartic agency. In this way, a large dose of calomel may defeat the object of the prescriber if he wishes to produce catharsis, whilst, by undergoing absorption and coming in contact with every organ, it may excite a new action in the whole secretory system. Even in this unusual quantity, it is, therefore, altogether harmless, the superfluous amount being, of course, a waste of the article.

We have many other cathartics, such as castor oil and rhubarb, the intensity of whose operation is by no means in a ratio with the dose in which they are exhibited.

In all these cases, in which such large doses of calomel are administered, the practitioner is led to persuade himself, that the climate requires them. But this argument is often most fallacious—it may be employed, too, to bolster up any plan,

that has received the approbation of a part or of most of the profession—too often, perhaps, without sufficient examination. It has been a common opinion, that in our ordinary bilious fevers, copious blood-letting, and the most active and irritating cathartics are imperiously demanded; and the practice founded upon this belief was at one time universal; so much so, indeed, that no other has been adopted extensively until of late years; but since a greater degree of attention has been paid to the condition of the mucous membrane in these affections, and since a better philosophy has suggested, that whilst we are keeping the different external sensitive surfaces free from all irritation, we ought not to be perpetually irritating the internal dermoid prolongation, practitioners have been induced to abandon the use of irritating cathartics; to keep the digestive canal free by the use of mild cathartics, which remove the morbid secretions as they are formed; and, by the proper use of sedatives—of which blood-letting is almost the only one—and of refrigerants, to reduce the inflammatory excitement. By such a plan—and we can equally invoke *experience* in its support—the ordinary bilious fevers of our country will be found to yield far more satisfactorily, than under the mixed sedative and irritating treatment, which was formerly universal, and still prevails too extensively. It is obvious, too, that where one system of medication is exclusively employed, it is impossible to draw any deductions from comparison, and we are not justified in affirming, that climate requires one system more than another until an equal trial has been made of all.

The Therapeutist has opportunities for witnessing the modifying influence of climate, where individuals pass from a torrid to a temperate or frigid region, and conversely. If the removal has been from a hot to a cold climate, the impressibility is diminished, and larger doses of medicines are necessary to produce the wonted effect; if from a cold to a hot, the impressibility is augmented; smaller doses are necessary; and, owing to the same cause, less powerful excitants produce fever; and stimulating drinks have to be carefully avoided.

“With respect to inuring foreigners to a country,” says a modern writer on Therapeutics*, “we are to preserve their organs against the impression of the climate, whose influence has been studiously examined. Thus the inhabitants of the south, when transplanted into cold and damp climates, should keep

* Bégîn, Op. cit. i. 93.

their bodies warmly clothed, to preserve themselves from bronchitis and pneumonia, to which they become much exposed; they are to assume gradually the use of warm and somewhat stimulating drinks. A substantial diet, consisting of animal food, with the moderate use of spirituous liquors, are the precepts to be observed in passing from a warm to a colder climate. Complete sobriety, and the use of vegetable food, are, on the contrary, necessary for those who pass from a northern to a southern latitude. In marshy places, abounding in simple or pernicious intermittents;—in those climates, that are devastated by plague, yellow fever, cholera morbus, or dysentery, it is necessary to shun the action of the deleterious miasmata, to approach only by degrees the *foyers* of infection, to avoid intemperance of all kinds, and every excess, which, by increasing their susceptibility and irritating the digestive organs, evidently dispose to endemic diseases.”

These last recommendations are equally applicable where the change of residence has been from a warmer to a colder region, even where there may be no endemic disease. It has been a matter of repeated observation, that the habit, acquired during a sojourn of some duration in any climate, remains for some time, after a removal to one of an opposite character. Dr. Edwards has shown this as regards the *physiological* performance of certain functions, and it has been long noticed pathologically in the watering and other places of Great Britain—the resorts of the healthy and the valetudinarian from British India. Whatever complaint may attack the stranger, it is apt to assume the intermittent type, the foundation of which has been laid, and impressed on the organism, by previous residence in a hot and markedly malarious region. In such cases, too, the predisposition to disease of those textures, in which erethism exists, owing to great atmospheric heat, is manifest. It is in individuals thus circumstanced, that M. Bégin recommends the tolerably free use of spirituous liquors—a measure, to say the least of it, of doubtful propriety, and in our opinion, more likely to produce irregularity of action, than any regimen that could be advised,—as it is impossible to keep up the excitation uniformly; depression must therefore succeed to the stimulation, and these latter in a degree proportionate to the extent of the former. In such a condition morbid agents must necessarily impress the economy more powerfully than if all had been regularity, in place of disorder.

What has been said of climate, as respects temperature, ap-

plies also to *seasons*. During the summer, the tendency of diseased excitement is to the mucous membrane of the alimentary canal; during the winter, to that of the lungs. The summer season is extremely fatal to infants in our cities, owing to a disease, which consists essentially in inflammation of the lining membrane of the tube, and is produced apparently by the combined action of heat and deteriorated air. The former alone appears to be insufficient to account for its prevalence, as it is rare in country situations, where an equal elevation of temperature may prevail, and one of the most certain modes of prevention is to remove the infant from the town to the country. Dr. Rush affirms, that in the whole of his extensive practice he knew of but one case of a child being attacked with cholera infantum, where removal to the country had been adopted as a prophylactic*.

6. *Mental Affections*.—We have numerous opportunities for observing the powerful effects, induced by the affective faculties on the different functions when in a state of health. All these are caused by sympathetic association with the brain; the organ secondarily affected being in a state of excitation or depression according to the precise character of the emotion. Of the therapeutical influence of different emotions I shall have to treat hereafter; some of them being important agents in the removal of different forms of disease.

The effects of one of the intellectual faculties, when inordinately exerted, on the bodily functions, are signal; and to these we must ascribe cures, that are said to have been effected by modes of management—often of the most revolting character—from time to time in vogue. In some nervous, delicate, and imaginative persons, pains can be felt any where: sometimes, too, actual disease is induced in this manner; and, at others, feelings as distressing as if they resulted from organic disease.

It is through the imagination and its influence on the body, that we must explain the effects of the credulity and superstition, so long employed as therapeutical agencies. At one period in the history of medical science, the *materia medica* consisted almost wholly of the machinery of magic. Some, indeed, as Pliny, affirm, that magic was wholly derived from medicine; but without inquiring into their precise order of precedence, it is certain, that there was a close affinity between them. The word *ananazipta*, scrawled on parchment, was said to cool fever. *Abacadabra*, supposed by Selden to be the name of a

* See the Author's 'Elements of Hygiène,' p. 166.

Syrian idol, when figured on an amulet, and worn round the neck, was supposed to possess the power of curing ague, and of preventing many diseases, especially when uttered in a certain form, and a certain number of times. An hexameter from the 'Iliad' allayed the agony of gout, and rheumatism yielded to a verse of the 'Lamentations.'

In all these cases, the effects upon the physical ailment may have been produced through the action of the mind on the body, of which we have so many marked examples, and to some of which I shall refer presently; but, in other cases, the incantation was used, where such agency could scarcely be presumed. Cato, the Censor, for example, pretended to be able to reduce luxations, after the manner of the Etruscans and Pythagoreans, by barbarous expressions, and by magical songs;—such as 'motas vaeta daries dardaries astatutaries,' or 'huat haut huat ista pista sistā, domiabo damnaustra et luxato.' Homer, too, affirms, that the bleeding of the wounded Ulysses was stopped by a charm, and the notion has even passed down to the present enlightened age, and prevails in certain parts of Great Britain. It is referred to by Sir Walter Scott in the 'Lay of the Last Minstrel,' and is noticed frequently in the popular poetry of the last century but one. In all these cases, however, it is probable that the enchanter employed more direct appliances to the injured part, as in the 'cure by sympathy,'—to which reference has already been made—and that he had not therefore implicit confidence in his charms.

The only remnant of the notion of charms, yet retained in medical language, is the word 'carminative,' applied to a class of medicinal substances, employed in cases, which were usually cured, or attempted to be cured, by *carmina* or incantations in verse, or to such as operated like *carmina* or verse-charms.

It is not much more than one hundred years since the doctrine of curing the scrophula or king's evil by the *royal touch*, or what Browne affectedly calls Adenochirapsologia, was implicitly credited, and not unfrequently followed. The first English sovereign, who touched for this affection, was Edward, the Confessor, who lived in the middle of the eleventh century, and the last, that encouraged it, was Queen Anne, who died about the commencement of the last century. One of the very last, subjected to the degrading mummary, was the illustrious Dr. Samuel Johnson, who, by the advice of a celebrated physician, Sir John Floyer, was carried to London in 1712, where he was actually touched by Queen Anne, but without effect.

Much of the success, that often followed this practice, has been ascribed to the influence of the mind over the body, but Wiseman, one of the fathers of surgery, who lived in the early part of the seventeenth century, and who had the best opportunities for observation, asserts that a part of the duty of the royal physicians, and serjeant—surgeons was to select such patients, afflicted with the evil, as showed a tendency towards recovery, rejecting all others; and as full confidence was placed in the effects of the royal touch, the disease was fortunately left to itself, and not officiously interfered with.

It would be as impossible, as unadvisable, to instance the various shapes, which superstition, applied to medicine, has assumed; and the hold, which it has taken on the minds of many, whose station in society, and whose general attainments, it might have been presumed, would have steeled them against the intrusion of such beliefs.

The science of medicine has suffered largely from the credulity and ignorance of those who profess it, and nothing can exhibit this more strikingly than the repulsive, and ridiculous agents, which have been had recourse to as a part of the *materia medica*; and some of which were introduced or recommended by individuals, distinguished, in their day, for superior intelligence. Thus, the illustrious Bacon believed in the virtue of charms, and amulets; and Boyle thought the thigh bone of an executed criminal a powerful remedy in dysentery. Celsus advises the warm blood of a recently slain gladiator, or a certain portion of human or horse flesh, for the cure of epilepsy; and remedies of this description are said to have been actually exhibited, with success, for the cure of epileptics, in the poor-house at Haerlem, by Abraham Kaauw Boerhaave, nephew to the celebrated Hermann, and professor of medicine at St. Petersburg, who lived so recently as the middle of the last century. Amongst the specifics of Alexander of Tralles, were—the liver of a weasel freed from bile, taken for three successive days, fasting; the skull of an ass, and the ashes of clothes, stained with the blood of gladiators. Pliny recommends stones, taken from the craws of young swallows, in epilepsy. Democritus mentions, that some diseases are best cured by anointing with the blood of strangers and malefactors, and others with the blood of our friends and kinsfolk. Miletus cured affections of the eyes with human bile. Artemon treated epilepsy with dead men's skulls, and Antheus, convulsions with human brains.

But, it may be said, most of these degrading examples of

credulous ignorance are taken from a far distant age, when physical science was yet in its first infancy. It would be easy, however, to show, that, at a much later period, the same credulity reigned where it was least to be expected; and even now the pharmacopœias of certain countries, eminent amongst nations for the advanced condition of mind in many of its aspects, exhibit evidences of the like degradation. Sir Theodore Turquet de Mayerne—who was physician to James the First, Charles the First, and Charles the Second, of England, and who was the most distinguished character of his day for learning, and as a practitioner—mentions, among his remedies, the balsam of bats for hypochondriasis; remedies taken from certain parts of adders; sucking whelps; earth-worms; mummy made of the lungs of a man who died a violent death, and many other articles equally gross, and irrational.

Even a century after this period of defective observation and experience, no great advancement had taken place towards a knowledge of the effects of medicines on the animal economy. The doctrines of pathology were experiencing considerable mutation; anatomy, and physiology were beginning to be vigorously cultivated; many improvements had taken place in the practice of medicine and surgery, and an immense number of fresh articles had been added to the *materia medica*, of which comparatively few, however, have been since retained; yet no great improvement had occurred in the discrimination of *false* from *true* facts, so far, at least, as regards the medicinal virtues of those articles which act insensibly on the frame, and which have been commonly denominated ‘alteratives.’

The lists of the *materia medica* of this country and of Great Britain are free from those offsprings of superstition and credulity, although they may be objectionable for the multitude of articles admitted into them. Time, however, and improved observation and experiment will rectify this evil, until—fortunately for the student, practitioner, and patient,—the list will embrace those agents only, whose virtues and applications are understood. Valuable is the time frequently lost in the exhibition of a remedy of doubtful efficacy. ‘*Anceps remedium quam nullum,*’ is, indeed a maxim of by no means universal application; and often is the safety of the patient endangered by the credulity of a too confiding physician. It is in this way, that the use of amulets, anodyne necklaces, camphor worn round the neck, &c., are objectionable. Presuming on their prophylactic or remedial powers, the wearer passes rashly into infected situations, when he

would otherwise have been cautious, and, if attacked with disease, postpones the employment of efficacious remedies until the time has gone by for their successful administration.

Different bezoards, or calculi found in the stomachs of animals, and at one time generally presumed to have the power of warding off contagious diseases, are still found in the pharmacopœias of Amsterdam, Brunswick, Spain, and Wirtemberg. A distilled water of young swallows—officinally called *Aqua hirundinum cum castoreo*—exists in the pharmacopœia of Mannheim, as an anti-hysteric and anti-epileptic;—the *oniscus* or woodlouse is in most of the European pharmacopœias, as a remedy in dropsy, and asthma;—the powder of the dried frog, *Bufo exsiccatus*, is in the pharmacopœias of Spain, and Wirtemberg, as an anti-hydropic; the powder of the human skull in the same pharmacopœias, as an anti-epileptic; the dried liver of the mad dog, and that of the wolf, in the pharmacopœia of Wirtemberg, as an anti-hydrophobic; the Egyptian mummy in those of Spain and Wirtemberg, with the hoof of the stag, formerly regarded as a specific in epilepsy;—besides many other articles equally absurd. Their retention is unfavorable to the scientific observation and induction of the people into whose pharmacopœias they are received; and it is somewhat surprising, that amidst the various pharmacopœias of German origin, that of Wirtemberg should be so far behind in rejecting these relics of ancient ignorance.

A useful lesson may, however, be deduced from all these facts. Many of the articles are calculated to produce considerable effect upon the imagination, and, in this way, they may really have been productive of advantage in the treatment of disease. Who, for example, could be told, that he was about to take a pill made of the powder of the human skull, or of an Egyptian mummy, without considerable emotion. Accordingly, it will be found, that most of these disgusting agents, as well as of the various nauseous remedies, yet retained in the pharmacopœias, asafœtida, castor, skunk-cabbage, &c.,—are administered to the nervous, and the hysterical, as well as in the various affections that occur in paroxysms, to make a powerful impression on the nervous system, and thus detract from the nervous irritation already existent. In this way, we account for the action of many antispasmodics, anti-epileptics, anti-hysterics, febrifuges administered for arresting intermittents, &c.; and for the efficacy of those methods of acting on the imagination,—animal magnetism, Perkinism, &c.,—which have excited the most extra-

gant enthusiasm, yet most of which have now died away, leaving scarcely a vestige of their having been ; but may be resuscitated under some other form, unless the experience of the past—by which, however, mankind are slow to profit—and the rapid diffusion of intellectual and moral light should be sufficient to choke them at their resurrection.

Perkinism, one of the most arrant delusions in the whole history of credulity, is the product of our own soil. Its proposer—Elisha Perkins, of Connecticut—is represented to have been a man of strict honour, and integrity ; but manifestly of an ardent imagination, and unbounded credulity. Impressed with the idea, that metallic substances might exert some agency on the muscles, and nerves of animals, and be inservient to useful purposes, as external agents, in the treatment of disease, he professed to institute various experiments, until he ultimately fancied he had discovered a composition, which would serve his purpose, and of which he formed his ‘metallic tractors.’ These consisted of two instruments,—one having the appearance of steel, the other of brass. They were about three inches long, and pointed at one extremity ; and the mode of their application was to draw the points over the affected parts in a downward direction for about twenty minutes each time. The effects seemed to be miraculous. The whole class of diseases on which the imagination is known to exert its efficacy,—and we shall see afterwards, that it is most extensive,—rheumatism ; local pains of various kinds, and in various parts ; paroxysms of intermittents, &c., yielded as if by magic. The operation was termed *Perkinism*, by the faculty of Copenhagen, in honour of the inventor ; and institutions were formed in Great Britain, which were regarded for a time—that is, during the existence of the delusion—as sources for the dispensation of health to suffering thousands. Hear the report of the ‘Perkinistic Committee’ of London on the establishment of their institution ! “Mr. Perkins has annually laid before the public a large collection of new cases, communicated to him for that purpose, by disinterested and intelligent characters, from almost every quarter of Great Britain. In regard to the competency of these vouchers, it will be sufficient simply to state, that, amongst others, whose names have been attached to their communications, are eight professors in four different universities ; twenty-one regular physicians, nineteen surgeons, thirty clergymen, twelve of whom are Doctors of Divinity, and numerous other characters of equal respectability. The cases published by these gentlemen in March last, the date of Mr.

Perkins's last publication amount to about *five thousand*. Supposing that not more than one cure in three hundred, which the tractors have performed, has been published—and the proportion is probably much greater—it will be seen, that the number to March last will have exceeded *one million five hundred thousand*."

With such apparently overwhelming testimony in its favour, can we be much surprised, that sufficient enthusiasm should have been excited amongst the credulous, for the establishment of the Perkinistic Institution?

A meeting was called for the purpose; the undertaking was unanimously resolved upon, and a subscription opened to carry the proposed charity into effect. The list was soon honoured by above a hundred subscribers, several with a donation of ten guineas, and only one or two subscribing annually less than one guinea. Lord Rivers was elected President of the Society; and eleven other persons of distinction, among whom was Governor Franklin, son of the illustrious Doctor; composed the list of Vice-presidents. On the 25th of July, 1803, a large house was opened in Frith-street, Soho square, for the reception of patients, and in which the medical attendant, matron, and servants constantly resided. The objects of this establishment—as stated by the society in their publication on the subject—appeared to be philanthropic, and were as follows:—"First. To afford relief to the disorders of the afflicted and industrious poor of the metropolis, if the remedy should be found capable of that desirable purpose: and—Secondly. To submit the long controverted question on the merits of the metallic tractors to the test of the severest scrutiny, the ordeal of experiment by disinterested persons, and thereby enable the public to form a correct opinion on the just pretensions of Perkinism:"—and it was farther proposed, in the report of the committee, that the British Parliament should investigate the merits of Perkinism, "and if convinced of its utility, honour it with similar patronage to other modern discoveries for the benefit of mankind." Yet, humiliating reflection! In a very brief space of time, the enthusiasm and the institutions died away; and no one, at the present day, believes that the effect was any thing more than an additional case, shewing the success, that must ever follow, for a time, the efforts of empiricism and pretension. Whilst the delusion regarding Perkinism was at its height, Dr. Haygarth determined to ascertain how far the effects might be ascribed to the power of the imagination. He accordingly formed pieces of wood into the shape of tractors, and with much

assumed pomp and ceremony applied them to a number of sick persons, who had been previously prepared to expect something extraordinary. He not only employed them in nervous diseases, but in all kinds of cases; and the effects were found to be most astonishing. Obstinate pains of the limbs were suddenly cured. Joints, that had been long immovable, were restored to motion, and, "in short," says Dr. Bostock, "except the renewal of lost parts, or the change of mechanical structure, nothing seemed beyond their power to accomplish."

Animal magnetism is at the present day exerting its therapeutical influence through the same agencies, as well as the employment of the magnet, for the cure of disease. It is precisely in such cases as those in which the tractors were found beneficial, that the latter succeed. Still, all these facts lead us back to the great influence exerted by the *moral* on the *physique*. Daily experience shows us how satisfactorily a case of disease will proceed, if the faith of the patient be implicitly yielded to the physician, and to the mode of treatment he is pursuing; and how unhappily every thing is apt to go on, when the contrary is the case. I have already cited a case, in which the same remedy had opposite effects, when prescribed by two different physicians—the confidence of the patient being reposed in the one, and not in the other.

It is equally important, for the successful operation of a medicine, that the confidence of the patient should be reposed in it, otherwise all is apt to be disappointment; and, on the other hand, imagination or faith may render inert medicines efficacious, and may even cause a medicine to have effects the very opposite to those it usually exerts. The late distinguished Professor, Dr. James Gregory, of Edinburgh, was in the habit of relating the following anecdote in his lectures, in illustration of the last mentioned effect. A student, who was laboring under fever, and who was under the care of the doctor, required the administration of an anodyne; and he was accordingly informed by the doctor, that he would order one for him, to be taken at bed-time. The patient, however, thought he said *cathartic*. The next morning, when the doctor called, he inquired what effect the anodyne had produced? "Anodyne!" replied the young man, "I understood it was a purgative, and a very active one it has proved. I have had four copious stools, and feel much relieved."

In Paris's life of Sir Humphry Davy we have a case, equally instructive. Dr. Beddoes having inferred, that the inhalation of the nitrous oxide must be a specific for palsy, a patient was se-

lected for trial, and placed under the care of Davy. Previous to administering the gas, Davy inserted a small thermometer under the tongue of the patient to ascertain the temperature. The paralytic, deeply impressed by Dr. Beddoes with the certainty of the success of the remedy, of which he knew nothing, no sooner felt the thermometer in the mouth than he declared he felt better. Nothing more was done, and the sick man was requested to return on the following day. The same ceremony was repeated with the same result, and, *at the end of a fortnight, he was dismissed cured*,—no remedy of any kind, except the thermometer, having been used.

It will be easily understood, then, how important and extensive may be the influence exerted by the mind over the body, in a therapeutical point of view, and that it is not unimportant to inquire into the likes and dislikes, the prepossessions and antipathies, of patients. It will often happen, that in the course of a long disease a desire may be felt for particular articles of diet, which may not seem, at first sight, extremely appropriate; but, in such cases, unless manifest evil would be likely to result, it is better to humor the individual slightly, or at least not to resist him strongly: for it occasionally happens, that instinctive desires or appetites are felt, which may not only be indulged in moderation with impunity, but with obvious benefit. The refrigerant regimen was at one time carefully avoided;—so long indeed as the doctrine of concoction of humors persisted; and one of the greatest improvements in the practice of physic, as applied to febrile diseases, was the free adoption of the cooling system, whenever the state of the body will admit of it. Instinct here led the way, and experience has proved the correctness of its monitions. Indeed, the efforts of the practitioner, in a case of simple fever, are mainly restricted to the employment of the refrigerant class of remedies. We still find, however, a prejudice against the use of iced water in fever where calomel is given. The feeling exists strongly in many parts of the Southern and Middle states, but it is rapidly yielding, and ought to be altogether abolished. Some cases have occurred in which individuals have seemed to catch cold or to have had disagreeable symptoms supervening, after cold water has followed calomel: but they have been cases of the *post hoc*, rather than of the *propter hoc*. I have been for years in the habit of allowing the use of iced water after calomel in fevers, and have never had the slightest evidence of any disagreeable results from it.

7. *Professions and way of life.*—These circumstances exert much influence not only on the susceptibility to disease, but on the indications of cure, and the mode in which these indications have to be fulfilled. We have this strikingly exemplified in the agency of those physical circumstances, which affect the economy through the mucous membrane of the digestive tube. If this has been regularly, and for a long period, excited beyond its healthy action by the use of alcoholic potations, not only is the foundation laid for diseases in other organs, but the whole frame becomes liable to unhealthy inflammatory excitement, on the application of causes, which would have been incapable of producing the effect on the individual before his system had been thus inordinately excited. The draymen, porters, coal-heavers and others of the British metropolis, are allowed as much as a gallon of strong porter during the day, and daily, and although they bear the appearance of rude health, they are liable to erysipela-tous inflammation after the slightest external injury; and, when attacked by severe internal disease, they do not bear the abstraction of blood like the individual of sound constitution and temperate habits.

But, independently of such habits, the mode of life has a manifest effect upon the human organism. The laborer, who is exposed to every vicissitude, is less susceptible of impressions, and consequently demands larger doses of medicines to produce the same effect, than he who is brought up in idleness and luxury. The effect of these habits is to render the frame extremely impressible, and hence the number of the nervous and the hysterical is infinitely greater amongst the upper classes of society. In this country, we have not the difference of way of life so signally exhibited as in Oriental climes, where a distinct classification exists in society. Amidst the revolutions, that occur in the fate of families, where the law of primogeniture does not hold, there is not much opportunity for tracing the effects of labor or of luxury through many generations; but in Hindusthan, where a difference of castes has existed from time immemorial, and where the barriers are effectually closed so as to prevent the entrance of the unprivileged, the effect is clearly shewn. The artisans are above the tillers of the soil, and they exhibit in their conformation, as well as in their functions, the influence of a greater degree of refinement. The same remark applies to the Polynesians, where a like division exists.

It is in the investigation of disease that the knowledge of the profession or calling is a more important topic of inquiry, than

in Therapeutics. In order to accurately appreciate, in many cases, the causes and seat of a disease, the nature of the daily occupation must be known. We are aware, for example, that the flax-dresser, the glass-cutter, the needle-pointer, &c., are liable to diseases of the chest, owing to the minute particles, given off in their operations, entering the lungs, and exciting irritation there, so as to produce many and fatal pulmonary maladies. Lead, again, gives rise to a series of symptoms, which have been called, collectively, 'lead colic,' or *colica pictonum*. When a person, consequently, laboring under those symptoms, presents himself to the pathologist, the inquiry suggests itself, whether he may not belong to one of those occupations in which lead is used,—as smelting the metal—manufacturing sheet lead, plumbing, glazing, painting, and composing in printing offices. By handling the metal, the carbonate of lead gets upon the fingers, and is swallowed, provided due cleanliness be not adopted. That this is the mode in which the poison of lead is generally received into the system is shown by the fact, that at an extensive smelting establishment in Cornwall, at which cases of *colica pictonum* were extremely common, the disease was almost abolished after an order had been issued, and rigorously enforced, that no artisan should be permitted to partake of food until he had washed his hands carefully with the assistance of a nail-brush.

These inquiries are altogether etiological, and they afford us examples of the cessation of the effect after the removal of the cause. I have already referred to the fact, that although this will often follow, in an immense multitude of cases, the diseased action will still persist after the removal of the cause. In the large class of diseases, which are symptomatic, every thing depends upon the accurate investigation and appreciation of the primary lesion; and this is often one of the most difficult points of pathological inquiry.

"The greatest attention of the physician," says Bégis, "is often required to enable him to discover the real causes of the disease before him. A few months ago I was called to a woman labouring under oppression of the chest, with a dry and frequent cough, and a painful sense of suffocation recurring at intervals: besides these symptoms, there was constant headache and vertigo, the conjunctiva was injected; and the pulse was full, hard, and not much accelerated. For two months, her menses had disappeared, in consequence of a violent mental affection. A copious bleeding, warranted by her vigor and youth, caused a sub-

sidence of the cerebral symptoms: the menses re-appeared; but the pectoral symptoms continued. During ten or fifteen days, I directed my treatment against what I considered to be irritation—either sanguineous or nervous—of the bronchi, but unsuccessfully. At last, during one of my visits, whilst conversing with my patient, I observed her executing that remarkable motion which accompanies difficult and painful deglutition. On my inquiring whether she often had to execute that motion, she answered in the affirmative. I then proceeded to examine the mouth: a slight irritation existed about the pharynx and tonsils; the uvula was elongated, filiform, and descended along the base of the tongue as far as the epiglottis. The true cause of the disease was now disclosed. The exuberant appendage of the velum palati was immediately removed in the usual way, and all the symptoms disappeared.”*

This case is not novel—although M. Bégin seems to regard it as such. It has long been admitted, that elongation of the uvula, by irritating the top of the larynx, may develop the ordinary symptoms of phthisis, in such as are predisposed to the disease; and it can readily be seen, that if tubercles already exist in the lungs, it can scarcely fail to excite them to suppuration. M. Bégin, however, uses the case cited as the foundation for a remark, that “circumstances of this kind are not unfrequent. The ‘physiological doctrine,’ in unfolding the origin and nature of a vast number of symptoms, heretofore considered as essential affections, has diminished the catalogue of diseases, and rendered their treatment more methodical and efficacious.” The ‘physiological doctrine’ has certainly not been without its good fruits; but the case, selected by M. Bégin to prove this, is not fortunate. It was not the doctrine, that attracted his attention to the uvula, but the symptoms, and they would equally have done so, had no ‘physiological doctrine’ been in existence. The doctrine has been as much injured by injudicious friends as by its most open enemies; and if greater discretion be not employed, it is probable, that it may break down under the weight of testimony adduced in its support.

8. *Causes, seat, period, &c., of the disease.*—Enough has been said respecting the modifications of the indications, and the mode of fulfilling them, according to the causes, and seat of the malady. It need scarcely be remarked, that the period of the disease likewise exerts considerable influence, and is occasionally a

* Op. cit. i. 79.

source of difficulty to the Therapeutist. In febrile diseases, the use of stimulants has been mainly abandoned ; but cases at times occur, when they seem to be indicated, and the practitioner is compelled to proceed with caution, and to decide with judgment, in his appreciation, whether they are indicated or the contrary. Dr. Rush affirmed, that there was a period in fevers, when blisters might be had recourse to with advantage, as stimulants, and to this period he gave the name 'blistering point.' If the excitement was above this point, blisters were improper ; if below, the contrary. The difficulty manifestly would be, to know this point. It is not fixed with thermometric accuracy, and, consequently, the idea of the blistering point fell to the ground with its distinguished proposer. It will be seen, too, hereafter, that blisters are by no means unobjectionable agents in the very cases, referred to by Dr. Rush as requiring the administration of excitants.

In inflammatory affections, the period of the disease occasions modifications which cannot escape the observant practitioner. Inflammation is apt to terminate in various ways, and it is important for the Therapeutist to determine whether such termination—as it is technically called—has supervened ; inasmuch as many of the ordinary signs of inflammation may be still kept up in consequence of the disordered action persisting, to a greater or less extent, in the affected tissues. Pneumonia, for example, may end in the effusion of a serous fluid into the lungs, or into the cavity of the pleura ; and this fluid may keep up irritation there. The excited state of vessels, too, may continue in the seat of inflammation, though not to the same extent ; and a very different system of medication may be advisable from that which was adopted before such effusion occurred, or at least the same activity of management may be altogether inadmissible.

In like manner, in the inflammations of mucous membranes, which have persisted for a long time—or, in other words, have become chronic—excitant applications are made to take the place of the soothing, which were adopted in the earlier stages, with obvious advantage.

Under different states or conditions of the body, remedies are found to produce the most various effects. During the existence of spasm in any portion of the system, opium may be given in immense quantities without inducing its wonted action. I have sat by the bed-side of a delicate female, laboring under the *cholelithus* means of Good—that is, under Gallstone in its progress along the ductus communis choledochus—to whom I have given

the tincture of opium by the tea-spoonful, until she has taken upwards of an ounce, yet without any stupor following its administration. In like manner, in neuralgia, extreme doses of narcotics may be demanded, as well as in mania and melancholia,—diseases in which the great nervous centre can be impressed with extreme difficulty. It is but lately, that an interesting lady, laboring under puerperal mania, took twelve grains of solid opium in the period of twenty-four hours; and an engineer of one of the Philadelphia steamboats, affected with a severe neuralgic attack in the intestines, took fifteen grains in the same time, without the least evidences of narcosis.

It is unnecessary to dwell upon this point. In every case of diseased manifestation, the mode of treatment has to be modified by the intensity, character, and period of the affection, whether the diseased action be above the median line or below it; or, in other words, whether excitants or sedatives appear to be indicated from the first.

To sum up.—We have seen, that, amongst the most important circumstances, which modify the indications of cure in disease, and the mode of fulfilling those indications, are—age, sex, original conformation, habit, climate, mental affections, professions, and way of life, as well as the causes, period, and seat of the disease; and all these have to be attended to, in order, that the Therapeutist may be enabled to administer his medicinal agents with judgment, and efficiency.

CHAPTER III.

OF MEDICINES.

A medicine defined—General action of medicines—Various modes of action—By simple, direct or local action—By indirect or general action—Through the nerves—Through absorption—Through revulsion—Medicines divisible into Excitants and Sedatives—Classification of medicines—Barbier's Classification—A. T. Thomson's Classification—Author's Classification.

A 'MEDICINE,' in the enlarged sense, is any agent administered for the purpose of curing or allaying morbid action. This definition would include the different articles of diet and regimen, which are employed medicinally, and if we were to go into a nicety of definition, we might have to point out the difference between aliments, medicines, and poisons, but this is unnecessary. The term is well understood to be appropriated to those agents, that are had recourse to therapeutically; or, in other words, to the various articles, which are received into the pharmacopœias or dispensatories, or which, in consequence of their action upon some tissue of the body, ought to be received into them.

The Greek word *φάρμακον* signified both poison, and medicine; and the generality of medicines are capable of exerting a deleterious agency if administered in too large a dose.

Every medicinal agent—to produce its effect—must impress some surface of the body, and it must perhaps be capable of impressing the surface, whether in a healthy or diseased state. To this, however, some plausible objections might be urged,—both directly and from analogy. For example, it is well known, that the secretions do not act upon the parts with which they are destined to come in contact, when such parts are in a state of health; but if they become diseased, then the same secretions may excite violent irritation. We have this strikingly exempli-

fied in *ardor urinæ*, an appellation, which indicates a symptom, not a disease. When the lining membrane of the urethra is healthy, the urine passes over it without exciting any uneasy sensation; but when it is inflamed—as in gonorrhœa—the healthy fluid excites violent irritation, and such a sensation of heat as to cause the mischief to be ascribed to the urine;—hence the name *ardor urinæ*—and the French name *chaudepisse*—for gonorrhœa.

An acrid condition of the bile has often, also, been invoked as the cause of diarrhœa. A better pathology teaches us, that the primary source of irritation is usually—universally perhaps—in the lining membrane of the digestive tube, and that the liver is secondarily implicated; the vitiated condition of the bile being very rarely, perhaps, the main cause of bowel affections.

Again, we have an instance in which the same remedy has very different effects according to the varying condition of the organ. Most of the believers in the abortive powers of the *secale cornutum*, or *ergot of rye* consider it devoid of action upon the unimpregnated uterus: many of them regard it to be capable of producing abortion, and all, that it adds to the efficiency of the parturient efforts, when once the process has become established.

These, and other facts, might induce us to accord with Sir Gilbert Blane, and Dr. Paris,* that medicines are frequently but relative agents, producing their effects in reference only to the state of the living frame; and there is truth in the remark of Sir Gilbert, that the virtues of medicines cannot be fairly essayed, nor beneficially ascertained, by trying their effects on sound subjects, because that particular morbid condition does not exist, which they may be exclusively calculated to remove; “thus, in certain states of debility, *tonics* may excite the system when languid, by their sympathetic influence upon the *primæ viæ*; while in a robust condition of the body, the effects of the same agents may be wholly inappreciable.”

In this, I repeat, there is truth; but, as a general rule, we should be justified in doubting the potent medicinal efficacy of any agent, which produces no effect whatever on the healthy body.

The *modus operandi* of remedies is not always clear; yet, by

* ‘Pharmacologia,’ Fourth Amer. Edit. with notes, &c., by Dr. J. B. Beck, p. 67. N. York, 1831.

careful analysis, we can generally appreciate it—in the main results at least—although we may have much difficulty in comprehending the precise mode in which these results are accomplished. This applies especially to those cases in which the agency takes place by sympathetic influence,—an influence proverbially obscure, and frequently invoked with the view of covering the ignorance of the observer; as *vitality*, and *organic action* are, at times, invoked by the physiologist, when the function cannot be explained by any known physical facts or arguments.

The modes in which the agency of remedies is exerted are chiefly as follows :

1. By *simple, direct, or local action*.—When a drug is taken into the stomach, it may merely affect that organ by simple contact; and no sensible impression may be made elsewhere. This is the simplest mode in which remedial agents act; and we have examples of the same kind in the application of caustics to parts, which we are desirous of eroding or destroying; in the use of astringents in hæmatemesis, and in cases of hemorrhoids, when the remedy is applied so as to come into immediate contact with the affected parts; in the use of collutories for sore mouth; of external agents in ordinary local inflammation; and of a poultice in suppurative inflammation.

Inflammation, according to its degree, affords us a good example of the mode in which disease may either be wholly local, or implicate the general system; and, likewise, of the way in which our remedial agents may affect the frame locally or generally. In a slight case of inflammation, we have the morbid action confined altogether to the capillaries implicated. The heart and larger arteries take no part; and the efforts of the practitioner are principally directed to the use of agents, whose action may be confined to the inflamed part. But if the inflammation be more severe, the whole circulatory system sympathizes, and remedies are required, which will act both on that system generally, and on the vessels more immediately concerned. At times, however, we see the very best results from applications, which are directed simply to the inflamed part; and as the increased action becomes soothed in the part, the soothing influence is propagated to the rest of the system, in the same manner as the morbid influence was in the first instance. In cases of ophthalmia—the ‘*ophthalmia membranarum*’ of Cullen—a few drops of a weak solution of the nitrate of silver, thrown into the eye, will often allay the irritation almost instantaneously, and the

increased action of the vessels communicating with the over-dilated capillary will speedily subside; but if, on the other hand, a very strong solution of nitrate of silver, or of any other astringent, be dropped into the diseased eye, it may excite intense irritation there, and the vascular apparatus of the part, and even of the whole system may be thrown by it into a state of turmoil. Soothe by appropriate applications, and the turmoil will cease.

In these last cases, we have examples, not only of the purely local or direct action of medicines; but also of the extension of this action elsewhere;—constituting the next mode of operation, which we have to consider.

2. By *indirect or general action*.—This is the mode, we commonly invoke, in the administration of remedies. In most cases of internal exhibition, the agent must first come in contact with the stomach, and, through this organ—the great ‘centre of sympathies,’ as it was considered, and designated, long before Broussaism existed—other parts become impressed, according to the elective affinity of the particular article for some tissue or organ rather than for another. It is owing to the stomach being so intimately associated with other parts, that it is generally chosen as the organ, through which our remedies are to act. If the functions of the stomach be disordered, as in dyspepsia, the whole system sympathizes; there is not an organ that does not feel the depressing irradiations; the brain and nervous system may become so disordered that the patient is subject to all kinds of hallucinations; and hypochondriasis thus becomes a common concomitant of dyspepsia. Nauseating remedies, again, exert their effect, through the stomach, on the whole system, so as to be most valuable agents in diseases of increased action; and, in short, as the different parts of the system can be affected by impressions conveyed through the stomach, so, conversely, no irritation can persist for any great length of time in any organ, without the stomach suffering; hence it is, that the organ has been designated the centre of sympathies.

The manner, in which this indirect effect of medicines is induced, is as follows:

a. *Through the nerves*.—Between every part of the capillary surface of the body there is the greatest sympathy or consent; so that if any one be inordinately and irregularly excited, parts at a distance are apt to sympathize; and this to a greater or less degree, according as such parts are more or less disposed to take upon them, at the time, a similar derangement. We see this strikingly exemplified when the feet are exposed to cold

and moisture; derangement takes place in the functions of the capillaries of the feet, and this derangement is reflected to every part of the capillary surface, so that in a dozen individuals, exposed to this cause of disease, the derangements may be as various in their seat as are the individuals themselves; owing to the greater predisposition of some particular organ to assume a morbid action in one rather than in another. Now, that which applies to the external capillary surface applies equally to the internal expansion of the skin, so that medicines, received into the stomach, by impressing the capillaries of that organ, may produce sympathetic results on parts at a distance.

That medicines do exert their influence through the nerves—as one of the *modi operandi*—is unquestionable. Dupuy divided the pneumogastric nerves in a horse, and then introduced two ounces of nux vomica, in the form of a bolus, into the stomach. No unpleasant consequences followed; whilst another horse—equal in size and strength to the former—to which the same quantity of the poison was administered, died in a few hours in violent tetanic convulsions. It is probable, that the reason why the former did not suffer, was the division of the nerves; but a doubt might be raised, with much plausibility in its favor, whether it was *directly* dependent upon this, or *indirectly*, owing to the function of absorption having been destroyed by the section.

The researches of modern Toxicologists have furnished us, however, with cases, that are unequivocal; of which one is sufficient for our purpose. If strong hydrocyanic acid be applied to the tongue of an animal, it will die instantaneously;—so rapidly, indeed, that there is not time enough to remove it from the lap of the experimenter before life has ceased. In this case, it is obviously impossible for the poison to have entered the bloodvessels, and to have passed, with the current of the circulation, to the great vital organ on which its deleterious agency is exerted. In many cases of poisoning, death is doubtless produced by the action of the poison on the nerves distributed to the coats of the bloodvessel, as where the poison is injected into the veins, and destroys life instantaneously.

Several of our medicinal agents, we shall find, act by preference on the nervous system, and of these all do not act upon it in the same way. Opium, for example, affects the brain, causing stupor; strychnine, the brain and spinal marrow, producing tetanic convulsions; and prussic acid excites coma with tetanus. The precise ground of these differences is inscrutable;

yet that they exist cannot be denied. There is a manifest affinity between particular remedial agents, and particular parts of the frame; and in whatever manner these agents are administered—whether by the stomach, or by the skin, or by infusion into the blood—they seek out the organs on which they act by preference; yet, why the tartrate of antimony and potassa should produce vomiting, when injected into the venous system, and rhubarb purge—why this elective affinity should exist—is inscrutable.

We can likewise affect distant parts by applying our remedial agents to the cutaneous surface. I have already referred to the effect produced on the capillary system elsewhere, by the irregular action induced through exposing the feet to cold and moisture. The effect of ablution, as a refrigerant in fever, is another example. If the skin be steadily hot and dry, cold or tepid water may be applied by ablution or sponging, so as to greatly diminish the morbid heat; and, accordingly, it is one of the most valuable febrifuge remedies which we possess. The capillary system, to which the cold or tepid fluid is applied, has its action diminished, and, through that extensive sympathy, which I have mentioned as existing between every part of the capillary system, the sedative influence is speedily extended to the rest of the frame.

It is to the external capillary surface, that most of our energetic counterirritants or revulsives are applied; although we shall find, that various local stimulants, administered internally, are indebted, for much of their efficacy, to the derivation or revulsion they excite. It obviously would be a matter of moment, if we could discover the parts that more particularly sympathize with each other, in order that our revulsives, and other agents might be applied with full effect, but this is a matter of difficulty, demanding a degree of patient investigation, which but few possess.

Dr. Thomson* regards the organ of smelling as a third medium for receiving the impression of medicinal agents on the nervous system; and the effect, he remarks, “is chiefly produced on the first and the fifth pairs of nerves distributed over the schneiderian membrane, lining the nostril, the adjoining sinuses, and the convoluted bones, so beautifully contrived to extend this surface in a limited space;” and he adds, that “many substances, which are supposed to enter the system by pulmonary absorption, such

* Op. citat. i. 12.

as the fumes of alcohol, tobacco, and ammonia, affect the habit solely by impressions made on the nerves of smelling." In support of this opinion, he quotes numerous experiments by Dr. Rousseau, of Philadelphia, which appeared to warrant the conclusion, that by simply closing the nostrils, either by compressing them with the fingers, or by filling them up, the fumes of ardent spirits, or of a strong decoction of tobacco, or an infusion of opium may be inhaled for an hour, without any unpleasant effect; whereas if the precaution be omitted, the consequences are proven to be most distressing.

Notwithstanding, however, the mode in which these results are stated, I cannot help doubting the accuracy of the experiments, and, of necessity, the deductions founded upon them. When these substances are inhaled, either by the nose or the mouth, they come in contact with branches of the fifth pair of nerves. In the nose, it is true, they impinge also upon the ramifications of the first pair, or the olfactory; but, on the other hand, in the mouth, they meet with branches of the hypoglossal and pharyngeal. It is admitted, that more effect is produced on the nervous system, when they are passed through the nose, than when they traverse the mouth; but this, I conceive, is owing to the greater degree of velocity with which they are made to enter the former than the latter cavity, so that the nasal nerves are more powerfully impressed than the buccal, and—as the supporters of absorption would say—their entrance into the circulation through the mucous membrane is rendered more ready; but it is not necessary—as Dr. Thomson thinks is the general belief—that such absorption should be pulmonary. All the mucous membranes are absorbing surfaces, and although a portion of the fumes may pass, along with the inspired air, into the ultimate bronchial ramifications, and be there absorbed, imbibition takes place in every part of the mucous membrane, from the place where it commingles with the skin at the mouth, to the point of termination of the minute air tubes; nor did I know that any one entertained the opinion, that ammonia enters the system by pulmonary absorption. As well might it be presumed, that any inorganic and mechanical excitant, applied to the nasal nerves, exerts its agency by such absorption.

Of the precise mode in which medicinal agents exert their influence on the nerves, we know little or nothing. It is not necessary, that the surface, with which they come in contact, should be physically modified, or that any organic change may

be perceptible. In the case of the instantaneously fatal application of the hydrocyanic acid, to which I have referred, there is no time allowed for the supervention of organic modifications in the part to which it is applied. The lethiferous influence is at once exerted on the nerves with which it is placed in contact, and the irradiations proceed from thence along the nerves—with the rapidity of lightning along conducting wires—to the great vital centres, whose action ceases on the instant, and immediately afterwards that of every tributary organ.

The mode, in which the influence of medicines is extended to different organs, through the nerves, probably differs. In many cases, the impression, made upon the part to which the agent is applied, passes immediately to the brain, and is thence reflected to the sympathizing organ. This is probably the mode in which medicinal agents generally produce their effect through sympathy; but in certain cases it would seem, that this reflection is not indispensable. A demulcent, by passing over the top of the larynx, may produce a soothing influence there, which may extend to other parts of the pulmonary mucous membrane—by what is termed *sympathy of continuity*, effected perhaps through continuous nerves. In the same manner, the acting of a suppository or of a glyster excites the upper parts of the intestinal tube to contraction. Physiology and pathology, indeed, furnish multitudes of examples of this kind of sympathy, as well as of the *sympathy of continuity*, of which we have an instance, where the muscular coat of the intestines is aroused to increased action, by the irritation of a cathartic on the mucous coat; or, where we attempt to produce an emmenagogue effect by the administration of cathartics—such as the preparations of aloes—whose action is mainly exerted on the lower part of the bowels.

The generality of physiologists of the present day, look to the nervous system as the great source and medium of communication of the different irradiations, by which distant organs are supposed to re-act sympathetically upon each other. The rapidity, indeed, with which the various actions of the nervous system are executed,—the apparent synchronism between the reception of an impression on an organ of sense, and its perception by the brain, as well as between the determinations of the will and their effect upon a muscle,—naturally attracted the attention of physiologists to this system as the instrument of sympathy; and we certainly know enough to infer, that, in many cases, in animals, the nerves appear to be the conductors; that the brain is, in others, the centre, to which the organ, in action, transmits its ir-

radiations, and by which they are reflected to the sympathizing organ; whilst, in others again, the effect is caused in the absence of nervous centre, and perhaps even of nerves, in a manner, which, in the present state of our knowledge, is inexplicable.*

It is not difficult to conceive, that by means of contractility, impressions—vibratory or other—may pass rapidly from one part of the organism to another, as they do in the vegetable, which—if we admit it to be possessed of a nervous system at all—has it in a primitive and rudimental form, and has certainly nothing like a nervous centre for the reflection of impressions. Vibrations, it is well known, communicated through the air from a sonorous body when struck, impress the organ of hearing, and light probably acts in a similar manner upon the visual apparatus, and we may suppose, without any violence to probability, that a similar vibration may exist in the human organism, so that an impression made upon one part may rapidly vibrate to another, independently of any thing like nervous communication.

6. *Through absorption.*—The proofs, that medicines may be absorbed from the alimentary canal and elsewhere, in their entire state, are as numerous as they are satisfactory. It is but necessary, that a substance should possess the requisite tenuity to soak through the coats of the veins, and, in this way, to get into the circulatory current. The facts and arguments, connected with the absorbent function of the veins, are so fully detailed in another work, that I shall merely refer to them.† But few physiologists of the present day doubt, that those vessels are capable of this function; yet it is denied by one distinguished individual, that medicines can pass unchanged into the venous system, or, in other words, that they can be absorbed in their entire state: the assertion and belief have been designated as a ‘relict of the humoral pathology;’ and he affirms, that “it must at least be acknowledged, that no substance in its active state does reach the circulation, since it is shewn, that a small portion, even of the mildest fluid—as milk, or mucilage, oil, or pus—cannot be injected into the bloodvessels, without occasioning the most fatal consequences.”‡

Setting aside the multitude of facts, which shew, that substances may be absorbed by the veins, and be detected by che-

* ‘Human Physiology,’ First Edit. ii. 444; Second Edit. ii. 486.

† Ibid. First Edit. ii. 20 and 53; and Second Edit. ii. 24, and 53.

‡ ‘Elements of Therapeutics’ &c., by N. Chapman, M. D. &c., &c., 6th Edit. i. 47.

mical reagents in the blood, we know well, that they can be injected directly into the blood without producing death; and that, since the time of Harvey until the present day, the 'infusion'—as it has been termed—of medicinal agents into the blood has been a common practice. It is asserted to have been first employed in 1657, at the suggestion of Sir Christopher Wren, and it has been largely practised at the veterinary school of Copenhagen, and with complete success,—the action of the agent being more speedy, and the dose required much less when thus administered.

Experiments of this kind have confirmed the well known but singular fact—already referred to—that medicinal substances exert their action by preference upon certain parts of the body, precisely in the same manner as if they had been received into the stomach. Tartarized antimony vomits, and castor oil purges, not only as certainly, but with much greater speed; for, whilst the former requires to be in the stomach for fifteen or twenty minutes, before vomiting is excited, it produces its effect in one or two minutes, when thrown into the veins.

Of late years, the custom has been, in certain diseases and in numerous experiments, to load the bloodvessels with warm water, so as to induce a state of preternatural fulness, and, in cholera, the quantity of saline solution injected has been enormous. The great, the necessary precaution, appears to be, that the fluid should not be too viscid; for it has been found, that thick fluids, such as oil, or mixtures of powders, are unable to pass through the pulmonary capillaries, in consequence of which the circulation is arrested, and death follows. Such was the result of several experiments on animals with powdered substances, undertaken by an enthusiastic physician of Boston—Dr. E. Hale, junr.—who had nearly fallen a victim to an experiment of this kind instituted on himself. Dr. Hale, desirous of observing the effects of castor oil when thus injected, attempted to pass it into a vein of the arm; he experienced, however, considerable difficulty in introducing it, and to this his safety has been ascribed. Soon after the injection he felt an oily taste in the mouth which continued for a length of time, and the medicine acted powerfully as a cathartic.

Again, a good deal depends upon the mode in which the injection is sent in,—as regards velocity. If a drachm of healthy bile be suddenly thrown into the femoral vein in a state of concentration, death soon follows; but if it be suffered to pass in very slowly, little or no inconvenience results.

It was the opinion of Bichat, that if a bubble of air should ac-

cidentally enter the venous system, it would cause death; but the experiments of Nysten and Magendie have shewn, that if it be introduced slowly, no unfortunate event need be apprehended. It is a cause of death after severe surgical operations, although it is not more than sixteen or eighteen years, since the *ratio moriendi*, in such cases, was first suspected.

Some animals will admit enormous quantities of air into the veins without perishing. Magendie instances the case of a horse, into whose veins he sent, as rapidly and forcibly as he was able, forty or fifty pints of air without occasioning immediate death, although the animal ultimately expired; and Lepelletier de la Sarthe alludes to similar experiments of his own, from which he infers, that the fatal action of the air is mechanical, and that it is possible to prevent the result by injecting so gradually, that the blood has power to disseminate, and perhaps even to dissolve, the gas with sufficient promptitude to prevent its accumulation in the cardiac cavities.*

No doubt, then, ought, I think, to exist, that medicines can be absorbed from the stomach or elsewhere in their entire state, and that when once in the circulation they may act on the nerves distributed to the inner coat of the vessel, so as to affect the great nervous centres, or may proceed with the current to act upon those organs for which they have a preference.

Substances may be absorbed from the cutaneous surface, although this is infinitely less easy than from its prolongation, which constitutes the mucous membranes. The cuticle is a great obstacle to absorption, for if it be removed in any manner, so that a substance, capable of absorption, can come in contact with the vessels of the corpus papillare, absorption takes place readily. The same thing happens—to a more limited extent—if we force the substance by friction through the cuticle. This is the mode in which we affect the system by means of the mercurial unguents. We select a part of the body where the cuticle is thinnest, and continue the friction until the globules of mercury disappear, or until it has been forced through the cuticle into contact with the corpus papillare.

We have the most undoubted evidence, that the mercury enters the blood. Dr. Colson detected it by introducing plates of polished brass into the blood, which became covered with a coating of mercury; and Dr. Christison affirms, that it has been obtained from the crassamentum of persons salivated, when no mercury

* Physiologie Medicale et Philosophique, Tome. i. p. 494.

could be detected in the serum. We know, too, that iodine enters the circulation. It was detected in the blood of persons using it medicinally by Dr. Cantu, of Turin; and as neither iodine nor mercury produces its effects on the constitution, until its use has been persisted in for some time, it is to be inferred, that they act upon the economy through the medium of the blood.

The method of administration by friction is called the *Iatroleptic* :* and one which consists in placing our remedies in contact with an abraded or vesicated surface, the *endermic*.† The latter method has been chiefly employed in recent times, and it has been advised by Bally and others, where, it was conceived, digestion would interfere with the action of the drug,—a succedaneum, which, according to the peculiar views of Professor Chapman, would be wholly inoperative, inasmuch as he considers every section of the absorbent system to be “endowed with the power of digestion and assimilation, and the lymphatics quite as conspicuously as the lacteals. This capacity is given as a provision of nature, to exclude noxious matters from the circulation.”‡ This opinion, we shall find, is a necessary pendant to his doctrines regarding the mode in which substances can enter the vessels.

Substances may likewise be received into the system, in their entire state, by the lungs. The whole of the respiratory apparatus is lined by a mucous membrane resembling that of the digestive passages, and as the substances, which enter the air tubes, are extremely tenuous, they can pass with facility into the bloodvessels. It is with this view, that narcotic and certain other inhalations are employed. The different respirable gases produce their effect in this way; and hence the hilarity caused by the protoxide of azote, or the laughing gas; and the exciting or depressing influences, that can be produced by inhaling appropriate gases.

I have already referred to the opinion of Rousseau, and Thomson, that ardent spirits exert their intoxicating influence by impressing the nasal nerves; but it is more likely, that much of the intoxicating effect produced on those who pump ardent spirits from large casks into small vessels, in extensive wholesale establishments, is owing to the vapor of the alcohol entering the lungs with the inspired air, and being imbibed by the pulmonary vessels.

* From *ιατρος*, ‘physician,’ and *αλειφω*, ‘I anoint.’

† From *εν* ‘in,’ and *δερμης* ‘the skin.’

‡ Chapman, Op. cit. p. 46.

It is probably in this way, that miasmata—both terrestrial and animal—exert their influence ;—their first impression being made either on the nerves distributed to the coats of the pulmonary bloodvessels, or on the brain when carried thither with the circulatory fluid. That they, occasionally at least, act in the former way seems to be suggested, by the rapidity with which the effects are exhibited, when a person—who, owing to previous attacks of malarious disease, has been rendered unusually susceptible to the action of miasmata—is subjected to their influence.

Thus far I have spoken of the absorption of medicinal substances in their entire state. It often happens, however, that they are decomposed prior to, or after entering the circulation. The same writer on Therapeutics, to whom I have referred, has, indeed, supposed, that in all those cases in which salts appear to have entered the blood in their entire state they are decomposed in the stomach ; that their components enter the circulation under the influence of the vital energies, which prevent them from recombining ; but that, as soon as they reach the secretory or excretory organs, they are thrown, as it were, beyond the sphere of those energies ; and their chemical affinities being brought into play, they recombine, and the substance is again perceptible, or can be detected, by tests, in the excretions.

A satisfactory reply to this hypothesis is, that substances have actually been detected, in their entire state, in the blood ; and besides, no great advantage to the economy could accrue from the decomposition in many cases, as the elements would be more injurious than the compound. The objections, indeed, to this view are so signal, that I need not dwell upon them. When substances can pass so readily into the vessels by imbibition, there is no necessity for invoking this operose process ; and we have seen, that no advantage to the economy could result from it.

There are, however, many medicinal agents, which require to be set free in the stomach before they can act on that organ. When certain vegetable substances are administered, especially in decoction or infusion, the parts, that are susceptible of digestion,—the mucilage, extractive, &c.,—are converted, whilst the medicinal component exerts its appropriate agency.

Dr. Thomson* thinks it is to this circumstance, that we may ascribe the time, which elapses between the swallowing of certain medicines, and the period when their operation becomes

* Op. cit. p. 19.

apparent. "Thus," he says, "if half a drachm of powder of the root of ipecacuanha be swallowed, from fifteen to thirty minutes generally elapse before vomiting is produced, a circumstance, which we may fairly attribute to the envelopment of the emetine—the active constituent of the ipecacuanha, in the wax, gum, starch, and ligneous matter of the root; it cannot exert its influence until extricated from these by the process of digestion." But this is not a happy illustration of his position, inasmuch as the same length of time is required for the emetic operation, when ipecacuanha is given in forms that are largely devoid of these vegetable accompaniments, as in the *vinum ipecacuanhæ* of the pharmacopœias, or in the various preparations of its active ingredient—*emetine*. Tartar emetic, too, is as long in inducing emesis, although it is well adapted for rapid absorption, or for instantaneous action on the nerves of the stomach.

It will be seen hereafter, that a more satisfactory mode exists of accounting for the delay in the operation of both these useful drugs, when exhibited for the purpose of acting as emetics.

Almost all writers on pharmacology affirm, that the acetate of potassa is decomposed in the stomach,—the acid being digested, whilst the alkali passes into the circulation, and is excreted by the kidneys. There must, however, be some error here.—The free acids, which are present in the stomach in a state of health, are the muriatic and the acetic; and if the alkali of the acetate of potassa were set free during digestion, it would be laid hold of by the muriatic acid, and enter the circulation as muriate of potassa. The fact of the existence of those acids in the healthy stomach shews, that many substances, when taken into that organ, must undergo decomposition through their agency. In the case of the acetate of potassa,—the free muriatic acid, doubtless, lays hold of all the potassa, unless the quantity of the acetate be very large. In the dyspeptic, affected with unusual predominance of acid, any alkaline carbonate taken into the stomach will excite effervescence, precisely in the same manner as when added to the muriatic or acetic acid out of the body.

The nitrate of silver is a substance, which can rarely enter the circulation unchanged. It is possessed of caustic properties, and is often used to destroy fungous granulations in wounds and ulcers. When applied in such cases, the nitrate is decomposed by the animal matter with which it is made to come in contact; the oxide of silver remains on the surface, and, by exposure to the air, becomes black. If the salt, too, be taken in-

ternally, for any length of time, it is apt to produce a leaden hue of the surface. "Now it is evident," says Dr. Thomson, "that this effect could not take place if the nitrate of silver were not taken into the circulation in an undecomposed state: for if the nitrate were decomposed in the stomach, and converted into muriate of silver, this is an insoluble salt, and consequently not fitted to be taken up by the absorbents. But if we admit, that the nitrate of silver is taken into the circulation in its undecomposed state, we can readily explain the manner of its decomposition by the capillary vessels of the skin, and its deposition in the rete mucosum, in the state of an insoluble muriate, which would necessarily render any tinge, communicated by it to the skin, permanent."*

It is difficult, however, to see, how the nitrate can escape decomposition from the muriatic acid always existing in the healthy stomach, as well as from the muriate of soda, which is present in the humors. It is probable, indeed, that, in the small quantity, in which it is administered internally, it never enters the circulation in the state of nitrate, but always in that of chloride; which,—as Dr. Thomson properly remarks,—is insoluble; but this is not an insuperable obstacle to its absorption. Calomel is equally insoluble, yet we want no proof, that the system is capable of being readily affected by it. The insoluble chloride of silver enters the sanguiferous system, is deposited in the rete mucosum, and—under the influence of light—is converted from a white, to a dark violet color,—an effect, which can be easily proved, by exposing chloride of silver to light, out of the body.

The bichloride of mercury or corrosive sublimate sometimes undergoes a conversion of great interest to the toxicologist. It may happen that a person has been poisoned by the bichloride, and yet there may be no evidences of the presence of any thing, except the protochloride or calomel. In such case, how are we to know, whether the protochloride is the result of the decomposition of the bichloride, or whether the person may not have taken the protochloride, a short time prior to dissolution. When the bichloride meets with albuminous matters, it is decomposed by them, and converted into protochloride; but, in such case, the protochloride is intimately united with them, and if the decomposition has been produced by the animal matter of the coats of the intestines, it will be intimately united with these

* *Op. cit.* p. 23.

tunics ; whilst, if the protochloride has been taken prior to dissolution, it may be observed lying upon the mucous surface, and in no way amalgamated with it.

Sometimes, it would seem, after an article has passed into the circulation, it is decomposed, either in the blood, or in some of the organs. If we force mercury through the skin, we can affect the salivary glands, and whilst the system is pervaded by the mercury, a gold watch will exhibit by its white coating, that the mercury is exhaled by the cutaneous surface. In like manner, if the blue pill, or calomel, be administered in adequate quantity internally, the watch will be equally coated by the mercury. We do not know the exact condition of the exhaled metal in these cases ; whether, in the case of the mercurial ointment and blue pill, it is still oxide,—in the state of calomel, still protochloride ;—or whether, in all these instances, it is not decomposed, and given off in the form of mercurial vapor. The fact, that metallic mercury has been detected in the bodies of such as have died under its influence, leads us to presume, that the metal may be reduced, and be exhaled in the form of vapor, so as to occasion the coating in question.

When substances enter the blood by absorption, if they can chemically combine with any of the principles of that fluid, they probably do so ; but this is not so readily accomplished, as might be presumed, owing to the quantity of organic matter, which frequently interferes largely with inorganic affinities.

Out of the body, we have full opportunity for witnessing the changes induced by the gases, and by various agents, on the blood, prior to coagulation, and whilst still endowed with vitality. They are signal ; and similar changes would, doubtless, be produced, could the same agents be applied, in the same state of concentration, to the blood, whilst circulating in the vessels. Numerous experiments have shewn, that when the alkalis, or their carbonates, have been given for a long time, the blood is rendered much thinner ; whilst directly contrary effects are observed to follow the use of acids—the coagulation being made firmer, and the blood of a deep, or dark color : as the pabulum, therefore, of the different nutritive processes is modified, we can readily comprehend, that the functions of secretion and nutrition may be importantly modified also.

The difference in the rapidity with which the absorption of medicinal agents is accomplished is great. It is dependent upon the degree of distension of the vessels, and on the existence or absence of erethism in the part. If polyæmia, or vascular

fullness exists, absorption is tardily effected; but if bloodletting be premised, the substance speedily passes through the coats of the bloodvessels, and enters the circulation. In some experiments by Magendie, in which water was injected into the vessels, so as to produce a state of artificial plethora, and a fluid was thrown into a serous cavity, it was found, that whilst the state of plethora existed, none of the fluid entered the circulation, but when blood was drawn from a vein, as it was abstracted, the fluid in the serous cavity rapidly disappeared under the eye of the observer, by soaking through the coats of the vessels, and entering the circulatory current. Hence it is, that in those active effusions or transudations into serous cavities, which constitute dropsies, bloodletting is a most philosophical and energetic remedy.

I have said, that the activity of absorption is greatly dependent upon the existence or absence of erethism in the part. If the lining membrane of the intestinal canal be in a state of great irritation or inflammation, the digestive, and other absorptions are no longer accomplished. This is strikingly the case in malignant cholera, which usually consists of a peculiar excitation in the capillaries of the intestinal mucous membrane. Under this excitement, the watery portions of the blood are exhaled, until that fluid is, in many cases, left so thick, as to be unable to pass along the vessels; and this, notwithstanding nutritive fluids may be constantly and largely administered. It is, on this account, also, that there is frequently so much difficulty in affecting gastroenteretic patients with mercury. In the last stages of many of the bilious and typhoid forms of fever, the absorbent function of the intestines is almost annihilated, in consequence of the irritation in the mucous membrane of the digestive tube.

c. *Through Revulsion.* There is yet another, and an important mode, in which medicinal agents exert their efficacy. I mean by *revulsion*, or *derivation*. It is a general rule, in the animal economy, that two diseased actions do not readily go on at the same time, with the like degree of intensity. This has been the subject of remark for ages, and for all ages, and many popular remedies have been suggested by a knowledge of the fact. When any morbid action is going on in the system, and a new source of irritation is artificially excited, it will often happen, that the new irritation, by attracting the nervous and vascular afflux to it, will detract or derive from the internal morbid action, so as to diminish, or wholly remove it. It is in this way that blisters, and the various counter-irritants, issues, setons, moxas, &c., produce

their beneficial effects, not by the discharge which they occasion. Hence it is, too, that good results from a popular remedy; the application of a garlic poultice to the thumb in cases of toothache.

But these are the only marked examples of revulsion. It results, likewise, from the action of every local stimulant. It follows the use of cathartics, and is the way in which their chief remedial agency is, in many cases, exerted. In head affections, especially in apoplexy, a revulsion thus effected is often most salutary; and for this purpose, when deglutition is impracticable, or even when not, powerfully stimulating enemata are thrown into the rectum with decided advantage. In like manner, the milder cathartics may be productive of benefit in gastro-enteric affections by the succession of sympathies, which they induce, in passing over the different tracts of the intestinal canal. Sudorifics, diuretics, too, and in short, as I have said, all local stimulants owe a part of their efficacy to revulsions; and one of the most valuable agents we possess in the treatment of protracted disease—mercury—is often employed with no other view. The avowed object of the practitioner is to excite a new action; or in other words to produce, artificially, a fresh pathological condition, and one which may derive from that, which has been so long existing.

Such are the chief modes in which medicinal agents exert their influence on the human economy.

I. Their agency may be altogether direct or local.

II. It may be general—through local influence.

1. By means of the nerves.
2. By absorption.
3. By revulsion.

The unbounded credulity, which at one time prevailed, regarding the effects of drugs, and which so long disfigured the science of medicine, has now almost passed away; and we observe less and less of the old feeling of confidence in the adaptation of particular drugs to particular cases of disease. The practice has become more rational; and the efficacious agents are now mainly relied on. Still many superfluities exist in the lists of the *materia medica*, which might, with much propriety, be dispensed with, and time will accomplish this. The plan now is,—to discover the seat and nature of the diseased action, and to adapt a remedy, whose properties are known, to the exigency;—*locally* or *generally*, as the case may require. We have no agents, that are possessed of specific properties, which are exert-

ed with unvarying uniformity on disease. Their action is modified by numerous circumstances. A cathartic may, in one case, excite emesis in place of catharsis; and, in another, an emetic may excite catharsis rather than emesis, whilst the words *febrifuge*, *antispasmodic*, &c., are mere terms to express the secondary result of some agent on the vital solid. It is in consequence of medicines possessing no *specific*—no uniform—influence, that so much skill and attention are required of the practitioner in the treatment of disease. At one time, it was supposed, that certain drugs are specifically adapted to combat certain morbid conditions, but the belief is now exploded, and even mercury—the panacea of some—is denied to possess any such power, and its action is more rationally accounted for.

From what has been said, it will appear, that although we may be perfectly acquainted with the ordinary medicinal properties of a drug, and although these properties may be essentially the same, the agency, exerted by it, may be different according to the precise character of the disease, and according to the age, sex, temperament, &c., of the patient. Were these points determinate, we could always calculate with certainty what would be the precise action of any medicinal agent.

With regard to the parts of the frame on which medicines act, we may affirm, that they are capable of affecting every tissue and every function—directly or indirectly. Like other influences, which surround the body, and are perpetually impressing it in some mode or other, remedial agents can act upon the living organs so as to modify every function. Ultimately, however, they must all affect the same great vital property of contractility, irritability or incitability, whichsoever we may term it, and which we know to be seated in every living tissue. Under the influence of this vital property, kept in action by appropriate stimuli, all the functions are accomplished, and when these stimuli are at a certain degree, they are accomplished in health; but if, from any cause, the vital force becomes exalted or depressed beyond the healthy standard, disease results; and such disease is a disease of increased or diminished action, as the case may be. Now, all medicinal agents, which, in this way, exalt the vital activity of the body, are excitants; and such as diminish it are sedatives; and we may, consequently, with propriety, class all agents, that are useful, or that are not wholly inert, either as *excitants* or as *sedatives*;—but the subject of the classification of medicinal agents will require a brief consideration.

The advantages of classification in science are obvious. The relations of articles to each other are, in this way, exhibited, so as to impress the memory, and to facilitate the investigations of the student. In no branch of science, however, is classification applicable under more difficulties than in Therapeutics, provided we are desirous of establishing such classification on the precise operation of medicinal agents ; whilst nothing is more easy than to form a natural classification of them, founded simply on the three great kingdoms of nature to which they may respectively belong.

The classifications of medicinal agents, based on their operation, are most numerous, and, at the same time, most unsatisfactory. Immense labour, and, of course, valuable time have been spent upon the subject, without any rich fruit. I have already said, that all remedial agents, which are possessed of activity, must belong to one of two classes,—*stimulants* or *excitants*, and *sedatives* ; we must except, however, certain agents, whose effects are purely chemical or medicinal, and which are not employed to effect any changes in the vital tissue.

Perhaps the best of all classifications would be one, founded upon the agency exerted on the different tissues ; but this arrangement, in the present state of science, is by no means easy, and, moreover, the action of medicines is so associated with certain terms,—as narcotics, tonics, sedatives, &c., employed to denote certain operations, which they are esteemed capable of producing, that, to abandon them, would be to throw obstacles in the path of the student, without the ultimate advantage accruing to him—of possessing a better knowledge of the *modus operandi* of medicines, than when a classification, somewhat resembling those usually embraced, is adopted. The classification of Barbier is founded upon the tissues affected, but it is extremely incomplete, and unsatisfactory, and, in consequence of the impracticability he experienced in grouping the various agents under appropriate heads, his last unmeaning division is, of course, a large one.

BARBIER'S CLASSIFICATION.

MEDICINES.	{	Which strengthen the tissue of organs, - - -	{	1. <i>Tonics.</i>
		Which stimulate the tissue of organs, - - -		2. <i>Excitants.</i>
		Which relax the tissue of organs,		3. <i>Diffusibles.</i>
		Which moderate too great activity of organs, - -		4. <i>Emollients.</i>
		Which diminish cerebral life,		5. <i>Temperants.</i>
		Which irritate the inner surface of the intestines, - -		6. <i>Narcotics.</i>
		Which irritate the gastro-duodenal surface especially, -		7. <i>Purgatives.</i>
		Which disturb the natural movements of the intestines, -		8. <i>Emetics.</i>
		Whose <i>modus operandi</i> is not determined, or which cannot be included in the preceding classes, - - -		9. <i>Laxatives.</i>
				10. <i>Incertæ sedis.</i>

One of the most recent classifications—and I shall allude to no other, as the notice would be unprofitable—is that of Dr. A. T. Thomson,* founded upon the classifications of Dr. Thomas Young, and Dr. Murray. It is liable to the objections, which must apply to all attempts to reduce the multitude of medicinal agents to any thing like a scientific arrangement, as well as to others, which appertain to it exclusively.

It is as follows :

I. VITAL AGENTS.

A. Influencing the body generally ;

a.—By operating directly upon the nervous system.

* *Increasing action*, - - - - - Excitants.

** *Diminishing action*, { *Primarily*, { Sedatives.
 { *Secondarily*, { Refrigerants.
 { Narcotics.
 { Antispasmodics.

* Op. cit. i. 164.

b.—On the Muscular and Sanguiferous systems :

Tonics.

Astringents.

C.—On the Secerning system :

Errhines.

Sialogogues.

Expectorants.

Emetics.

Cathartics.

Diuretics.

Emmenagogues.

Diaphoretics.

B.—Influencing the body solely by their action on
the part to which they are applied.

Epispastics.

a. *Rubefacients*.

b. *Vesicants*.

c. *Actual cauterants*.

II. CHEMICAL AGENTS.

A.—Influencing the state of the body, or its contents, by their chemical properties.

* *Acting on the surface*, - - - Escharotics.

a. *Potential cauterants*.

** *On the contents of cavities*. - {
Antacids.
Antalkalies.
a. Antiseptics.
Antilithics.

III. MECHANICAL AGENTS.

Demulcents.

Diluents.

To the three great divisions of Dr. Thomson no objection can be urged ; but when we come to consider the different subdivisions, and the ascribed *modus operandi* of many of the classes, we find much room for difference of sentiment. I may observe by anticipation, that there is no adequate ground for placing *Excitants* amongst those agents, that operate directly on the nervous system ; and *Tonics*, amongst those, that act on the muscular and sanguiferous systems ; nor do I see how *epispastics*

can be regarded as the only agents, that influence the body *solely* by their action on the part to which they are applied.

The class of 'anthelmintics,' which could not have fallen conveniently under any of Dr. Thomson's subdivisions—with the views, which he probably entertains of the mode, in which their therapeutical agency is exerted—has been wholly omitted: and although anthelmintic virtues are assigned to the ordinary medicinal agents, which are conceived to possess such virtues—when these agents are referred to under other heads—it is singular, that the class is neither mentioned in the table, nor in the body of the work. It seems to have altogether escaped Dr. Thomson's attention.

To the classification, about to be proposed, objections may doubtless be urged. I have said, that it is impracticable to form any, which can be altogether unobjectionable. It has been more than once remarked, that all agents, capable of affecting the vital tissue so as to modify its functions effectively, may be classed under the head of *excitants*, or *sedatives*. But, in addition to these—what may be called—'vital agents,' we have some other classes of medicines, which, in consequence of their effect being almost purely chemical, without modifying the condition of the vital tissue, may be appropriately designated 'chemical agents;' and, again, there is one other class—equally without influence on the vital manifestations, and acting simply or chiefly on the mass of humors—which may be properly ranked under the denomination of mechanical agents.

This is probably as simple a classification as can be adopted, and one altogether intelligible to the student. It does not involve questions connected with the intimate *modus operandi*, which will engage attention under the consideration of the different classes, whilst it embraces some classes not admitted into the classification of Thomson, and which, we shall see, comprise some of our most useful medicinal agents. The class of *Anthelmintics*—in the sense of—"medicines, which prevent the generation of entozoa within the body," is placed next to the class of tonics; because the predisponent cause of their unusual multiplication is a want of tone of the system generally, and of the stomach in particular; and if we confine our attention to the destruction of these parasites, by true anthelmintics, or, in other words, by agents directly destructive to entozoic life, we do but little;—the most important step of all being to remove the predisposition to fresh generation; precisely as in the case of inter-

CHAPTER IV.

OF EXCITANTS.

Irritation, not debility, the great lethiferous agent—Causes of death in cases of extensive abscess, phthisis pulmonalis, &c.,—Debility in one organ may suggest irritation in another—Cases of really diminished action—Division of excitants.

ALTHOUGH the doctrine—that debility is the cause of almost every diseased action—is now nearly exploded, there can be no doubt, that, owing to morbid agencies, the vital manifestations of a part may be enfeebled, and that a plan of treatment, which will arouse them to greater activity, may occasionally be required. Even so late as the time of Cullen it was maintained, that the great indication to be followed by the Therapeutist, in cases of fever, was to obviate the tendency to debility and death. A better attention to physiology and to pathology has shewn us, that the great lethiferous agent, in such cases, is irritation, and that death often results from this cause, where its agency was at one time altogether unsuspected.

It has often been observed, that where large collections of matter have formed, and been discharged by the surgeon, febrile irritation of the most fatal kind has rapidly supervened, yet little or none of this irritation was present before the matter was evacuated. It was accordingly supposed, at one time, by every surgeon, that the irritative fever was the result of debility induced by its discharge. It is obvious, however, that in this case, from the time that the pus was secreted, it was as extraneous to the vital operations as after its discharge. The removal of that, which was already secreted, could not add to the existing debility. The true cause of the hectic fever, established in such cases, and present to some extent, from the moment that ex-

tensive suppuration begins to be established, reposes in the circumstance, that when once the pus is discharged, a recuperative effort takes place in the vessels of nutrition of the inner paries of the cavity; and the severe irritative fever, which follows, is owing to the constitution sympathizing with the irritated capillaries, and to such an extent, that the system too often sinks under the effects of its own reparatory exertions.

No one, at the present time, conceives, that the consumptive are worn away by the discharge, that takes place from the substance of the lungs. Phthisis pulmonalis is a chronic inflammation of these organs, ending in suppuration and disorganization. Hectic fever is set up in this case, as in every other where extensive mischief exists, and great recuperative effort has to be exerted; and, under the irritation of this fever, the spark is gradually extinguished.

It is not in these cases only, that the prevalent doctrine of debility has been exploded. The practitioner, when he observes signs of debility in an organ or in the system generally, inquires, whether the vitality of other organs may not be exalted, and whether there may not be a source of irritation existing somewhere, which, by detracting from the vital manifestations in other parts, may be the cause of the local or general evidences of asthenia or debility. A strong man, in a state of health, may be attacked with general fever, accompanied with great langour and lassitude, with every sign, indeed, of apparent debility—yet a very slight examination may exhibit, that an undue quantity or improper quality of diet is exciting gastric irritation, which is the source of all the asthenic feelings. Again, a man, in a condition of rude health, may be exposed to febrific miasmata; and, in due time, without much previous indisposition, may exhibit appearances of the greatest debility; and, although a short time before he might have been able to raise pounds, he may be now scarcely able to raise as many ounces. Yet, it is impossible to presume, that such debility is real; it is rather dependent upon the excessive irritation in certain parts of the organism detracting from the vital forces in other parts; and the important point for the Therapeutist is,—to direct his attention to the removal of this irritation, after which the effects—the asthenic feelings and symptoms—will cease also. Accordingly, at the present day, no practitioner, at the commencement of a febrile condition, is deterred from the use of evacuants by symptoms of languor and lassitude,—experience and reflection having sufficiently instructed him, that the proper employment of such agents is well adapt-

ed to equalize the vital manifestations, by reducing the inordinate action existing in some detached part of the organism, and thus equalizing the circulatory functions.

Even in cases of cachexia, where general debility appears to be unequivocally manifested, some lurking mischief is generally present; and when, in such cases, we find a change of the atmospheric, and other influences surrounding the patient, productive of signal benefit, it is owing to the equalizing influence of change of air, society, and scenery, which detracts from the local mischief, and exhibits its genial effects over every part of the frame; hence, the wonderful recoveries we annually witness in chronic diseases from a visit to our trans-Alleghany or other watering places;—the use of the waters having often had no agency in the cure,—frequently, indeed, not being employed at all.

Still, there are conditions of the frame, in which the vital activity is diminished far below the healthy standard; when the vascular system is in a state of anæmia, the blood less rich in globules and nutritive pabulum; and the solids of loose coherence, so that the blood escapes through them with facility, or they rupture on the slightest mechanical violence,—or when, after violent exaltation of the vital forces, a corresponding depression or state of collapse supervenes. In such cases, excitants may be imperatively demanded.

In the great division of excitants, according to the classification here adopted, are included those agents whose excitant action is local or general; in other words, whose action is exerted upon some particular organ or tissue, affecting it by preference, and comprising the class of ‘local stimulants’ of Murray; or whose action is that of simple stimulation on the tissue with which they are placed in immediate contact, extending or not to the general system, so as to produce augmented action of the nervous and sanguiferous systems.

The classes of medicinal agents, which exert their efficacy in the latter way, are:—*Excitants proper, Tonics, Anthelmintics,* and *Astringents*; in the former, *Emetics, Cathartics, Emmenagogues, Abortives, Diaphoretics, Errhines, Sialogogues, Diuretics, Expectorants, Sorbefacients, Revellents,* and *Antispasmodics*. These we shall consider in detail.

SECTION I.

EXCITANTS PROPER.

Definition of excitants—Carminatives—Chiefly derived from the vegetable kingdom—Simple direct action of excitants—General effect of excitants—Excitement and collapse defined—Excitants act also as revulsives—Therapeutical application of excitants—In gastric and intestinal affections—In fevers—In inflammatory diseases—Catarrhs—In the neuroses, hysteria, epilepsy, paralysis—In topical inflammation—Mental excitants.

‘EXCITANTS,’ ‘Stimulants’ or ‘Incitants,’* may be defined as follows :—agents that increase the organic actions by impressing the contractility of the part to which they are applied ;—the excitation thus induced being extended, or not, to the rest of the system.

The organ, whose contractility is generally selected by us to be first impressed, when we administer excitants, is the stomach, although the skin and mucous membranes—especially the schneiderian membrane, and the lining membrane of the rectum, are at times chosen. The extensive sympathy, which exists between the stomach and the rest of the system—especially the nervous and sanguiferous portions—renders it best adapted for the receipt of the impression, which excitants are capable of *directly* producing.

In the classification of Murray, which is closely followed by Paris, there is no class of excitants. The latter writer has, indeed, a class of *Aromatics*, which he defines—“Substances of a fragrant smell, which produce upon the organs of taste a peculiar sensation of warmth and pungency, and occasion, when swallowed, a corresponding impulse upon the stomach, which is rapidly communicated to the remote parts of the body ;”† but this definition is obviously insufficient to embrace the whole class

* Remedia stimulantia, from excitare, ‘to stir up.’

† ‘Pharmacologia,’ Amer. Edit. (Beck’s) p. 81.

of excitants, as several agents of an exciting character,—caloric, electricity, and light, for example,—can in no wise be regarded as aromatics. Aromatics can be looked upon only as a subdivision of excitants, whose *modus operandi* essentially resembles that of the whole class.

Of old, aromatics were employed chiefly as ‘carminatives’—a subdivision not now admitted, although we still retain the term, which is derived—as before remarked—from *carmen*, ‘a verse-charm,’ and was introduced at a period of superstition, when magic and incantations were had recourse to, and when physiology and pathology were almost unknown.

Carminatives were employed to expel flatus from the stomach and intestines, and they afford us a good example of excitants producing their effect simply on the parts with which they come into immediate contact, or, at least, without exciting the general system. When flatus accumulates to any great extent in the alimentary canal, the muscular fibres become so far distended that exhaustion is produced, and they are incapable of acting with sufficient energy to expel the flatus, or to diffuse it through the tube; hence the pain, which accompanies such over-distension in flatulent colic. But if, in this case, an aromatic or carminative be administered, the excitement it produces in the mucous membrane, with which it comes in contact, is extended, by contiguous sympathy, to the muscular coat, which is aroused to greater contraction, and, in this way, the flatus is diffused; a part may escape through the cardiac orifice of the stomach, if that organ has been the seat of the affection, or it may descend into the lower intestines. The older writers, as we have seen, not being able to comprehend how the sudden relief was accomplished in such cases, asserted its operation to be ‘carminative,’ or like that of a charm.

The most of the excitants are derived from the vegetable kingdom, and the property, on which their virtues are dependent, is usually volatile oil, or some analogous principle; hence the action, and form of administration, of the vegetable excitants affords but little difficulty to the student. In the generality, indeed, the active principle—the volatile oil—is separated by distillation, and is administered in this form, so that the plants and their products, whence the oil has been derived, are but little used in Therapeutics. This is the case with carraway, aniseed, lavender, the mints, cinnamon, cloves, nutmeg, &c. In other cases, the oil is rarely separated, as in the roots of the *acorus calamus*, and ginger, the wood of the *sassafras*, &c. Here, the sole care

is—not to apply heat to such an extent as to drive off the volatile oil, and, accordingly, such agents are either given in substance or infusion,—not in decoction.

The excitants, that are derived from the inorganic kingdom, exert their agency in various ways. They have, as Dr. Thomson has remarked, no principle in common to which their operation can be referred.

The case of flatulent colic is one in which the simple direct action of excitants is invoked; and it is manifest, that similar principles would lead to their adoption in affections of the stomach dependent upon debility of the muscular coat,—as indicated by flatulence, sense of distension, &c., without any evidence of inflammatory or other irritation in the lining membrane of the stomach or duodenum. Accordingly, it is, and has been, a common custom, with all nations, to use some alcoholic liquor after food difficult of digestion has been eaten. In Scotland, a liqueur-glass of whiskey is taken after fish, from an old impression that it does not readily digest without some adjuvant. In England, brandy is taken after duck, or goose, or pork; and, in Germany, kirschwasser. A maxim in the dietetic precepts of the school of Salernum exhibits, that this was the feeling, as regards pork, seven or eight hundred years ago, but at that time wine was used instead of the stronger alcoholic liquors.

*“Est caro porcina sine vino pejor ovina,
Si tribuis vina, tunc est cibus et medicina.”*

That, which applies to food difficult of digestion, applies likewise to the cases above referred to, in which the digestive powers are enfeebled; and to those especially where the defect lies in want of due contractility in the muscular fibres of the stomach and small intestines,—particularly of the former. When hot water or dilute alcohol—pure, or medicated—is taken into the stomach, it produces two effects. It stimulates the mucous membrane to an increased secretion of those fluids, that are inservient to digestion; and, by contiguous sympathy, the muscular fibres are aroused to greater activity, so that the contraction of the organ upon its contents is more marked:—hence the eructation, which follows the use of these excitants, and the absence of those uneasy feelings of distension, which would have been experienced had these agents been withheld. Alcoholic liquors, moreover, have a chemical operation, not possessed by ordinary excitants. They coagulate the albuminous matters in

the stomach, and thus aid in giving the contents of the organ a texture better adapted for the accomplishment of digestion.*

But we shall have occasion to refer to the particular examples of local stimulation, when the consideration of the therapeutical application of excitants occurs. At present, it is necessary to inquire into the general effects produced by stimulants, when their action is not restricted to the part with which they come in contact, and when the object of the practitioner is to exhibit them so as to act upon the whole system.

The nervous susceptibility is greatly augmented; the action of the moving fibres increased; the pulse rendered more frequent and forcible, and the function of calorification largely excited,—if the quantity of the agent be great, or its powers considerable. These effects must obviously require a larger dose of the excitant than where the object of the practitioner is merely to produce a local stimulation. A small dose may excite the lining membrane of the stomach to a greater secretion of the digestive fluids, and the muscular fibres to greater activity, so that the food may be digested more readily and rapidly; chylosis be facilitated; the blood move with somewhat greater rapidity in the vessels; and the various secretions, and excretions be more readily effected; but if the dose be carried much farther than this, irritation may be excited in the part with which the excitant comes in contact, or true inflammation may result, so that a general febrile condition may be induced, under which many of the functions enumerated, instead of being facilitated, may be retarded—especially the secretions and excretions—which are never properly accomplished during fever. These, however, are the results of too strong a dose; the quantity, by careful attention, may be so tempered, that nothing but a salutary excitation may supervene; this, however, constitutes one of the great difficulties in the proper therapeutical employment of this class of agents.

There is another important consequence of stimulating the whole, or any part of the organism beyond the due point—namely,—that a corresponding state of depression succeeds; so that, after violent excitation, depression—constituting collapse, or almost total prostration—may ensue. This kind of compensation of action appears to exist to a great extent in the organism. If any organ be greatly over-excited, we observe other organs struck with debility, and hence it is, as we have seen, that the judicious pa-

* ‘Elements of Hygiene,’ p. 324.

thologist—when he observes want of action, or apparent atony, in any organ—carefully investigates, whether the deficiency of vital manifestation may not be compensated by inordinate action elsewhere.

This supervention of collapse after over-excitment renders it a matter of moment to be able to determine what are the healthy manifestations, by which the evidences of exaltation or diminution of the vital forces may be determined. This, however, is not an easy matter, and it varies in different individuals. No two persons have the functions of circulation, innervation or calorification alike. Dr. Thomson* has attempted a solution of the question, by affirming, that “*excitement* implies every state of the nervous system in which the energy of the brain is greater than that, which, in the waking state of a healthy man, is exactly adequate to the ordinary functions of the system. *Collapse* that state in which the cerebral energy is so much diminished as to suspend the exercise of the functions of sense and volition—a state of defective activity of the brain, similar to that which causes sleep, only in an augmented degree. There can be no doubt, that a certain supply of blood to the brain is essential for the support and continuance of its functions; too great an increase of the momentum produces *excitement*; a diminished afflux, on the contrary, within certain limits, or an exhaustion of the moving powers from previous over-exertion, is productive of *collapse*.”¹⁷ But these definitions do not solve the difficulty. The constitutions of individuals differ so much, that we cannot easily determine what are the healthy manifestations in any particular person. Our opinion must be deduced from the catenation of circumstances in each case.

Whenever, therefore, excitants appear to be indicated in disease, the Therapeutist has to be cautious not to push the excitation too far, lest the vital energies should be worn out; and, for the like reason, it becomes important, when once the cautious use of excitants has been commenced, that their administration should only be uninterrupted, under a wise caution, lest a state of collapse, or of diminished action, should succeed, proportionate to the preceding stimulation. This is especially demanded in protracted fevers, in which excitants may have been employed, and with propriety. The omission of the accustomed stimulus is apt to lead, in such cases, to much mischief.

The state of collapse, to which I have just referred, as super-

* Op. citat. i. 175.

vening on over-excitement, differs essentially from that, which attends many of the malignant cases of spasmodic cholera. In this fatal malady, owing to the excited state of the lining membrane of the intestines, the watery portions of the blood are often largely exhaled, and passed off in the evacuations, until ultimately the blood becomes too thick to circulate in the extreme vessels; the nervous system does not receive its due supply of blood possessing the requisite properties, and even the great organ of the circulation, and the whole circulatory apparatus, have their functions impaired, and ultimately annihilated. But this state of general collapse is not the immediate consequence of previous general excitement. It is mainly owing to the changes effected on the circulatory fluid, by a local irritation in a part of the system, where nutritive absorption is effected in health, but wholly suspended in this disease, whilst one of the chief constituents of the blood is copiously exhaled from the vessels. This is the case, at least, with the great mass of cholera patients, but, occasionally, the deadly impression appears to affect the nerves of organic life, in such sort, that the functions under their presidency can be no longer accomplished. It is pretty clear, indeed, that in every case of cholera, the function of innervation must be first impressed, but according to the dose of the poison the capillaries of the intestines may still be capable of excessive action, in the manner I have suggested, or the organs of organic innervation may have their functions rapidly and totally annihilated; in consequence of this, remora of blood is occasioned, giving rise to the congested or engorged state of the vessels of the mucous membrane, perceptible on the dissection of many of those, who have died of this fatal malady.

We shall see hereafter, that all tonics are excitants; but that the former do not stimulate beyond the healthy standard, and are more permanent in their action, whilst the latter are always employed to excite more or less beyond the healthy degree, and are more transient in their operation, although their effects may be more speedily exerted.

A valuable mode, in which some of the agents belonging to this class of medicines exert their efficacy, is by revulsion. The whole class of counterirritants and epispastics are properly excitants;—but their intimate examination will be entered upen under a distinct head. Mercury and caloric are also employed with this view in disease. In syphilis, the operation of the former agent appears to consist in its exciting a new action in the system. Under its influence, a mercurial fever arises, accompa-

nied by general excitation of the whole glandular system, but especially of the salivary glands ; this artificial disease is incompatible with the specific malady, which possesses the frame, and, accordingly, the latter gradually yields. In like manner, when a morbid catenation has been present for a long time,—if the system can be brought under the influence of mercury, the catenation may be broken in upon, and the artificial disease may so attract the vital energies, that the long existing mischief may be removed ;—hence, the great advantage of mercury in obstinate fevers, and, indeed, in most chronic irritations. In such cases, it is but necessary to affect the mouth ; to occasion mercurial fœtor of the breath, falling away of the gums from the teeth, and slight irritative fever,—in order that we may produce the full remedial influence of mercury. At one time, in syphilis, it was considered advisable to salivate the patient in proportion to the duration of the disease ; and the same plan was adopted in other affections where mercury was conceived to be indicated. But it is now admitted by almost all, that salivation is an evil ; that the good effects of the mercurial medication are not in a ratio with the quantity of the salivary discharge ; and that the whole efficacy is dependent on the new disease, which is established in the economy, detracting from, or being incompatible with, that already existing.

The catalogue of the *materia medica* furnishes us with a liberal choice of excitants ; yet, so large a portion of them essentially resemble each other in their properties, that the list might be much diminished without any disadvantage to science or humanity. There is scarcely an aromatic vegetable, the essential oil of which has not been admitted into the pharmacopœias of Europe, or of this country, yet almost any one of them might be selected as a fit representative of the whole.

In the Therapeutical application of the class of excitants we have always to reflect, whether the indication is simply to effect a local stimulation, or to have the excitation extended to the general system ;—whether, in other words, it is merely a morbid condition of the digestive function, that has to be combated, or atony of the great systems—nervous, vascular or secretory.

Where the mischief is purely gastric, and dependent apparently on want of tone of the muscular coat, or of the organ generally, the diffusible stimulants are chosen, if the uneasiness be

urgent—as where flatus is present to a great extent. Ether, alcoholic liquors, hot water, any of the essential oils, &c., may be employed with this view, but it is obvious, that any stimulation, thus induced, can only be momentary; the cause of the uneasy symptoms may still persist, and demand a treatment more permanent in its influence. Correct pathology consequently suggests, that, in these cases, recourse should be had to a combination of tonics and excitants, in order that whilst the latter palliates the uneasy feelings, the former may radically remove the want of tone, which gave origin to them. Accordingly, one of the bitter roots or barks is usually given in infusion, along with some aromatic;—the bitter principle of the root or bark exerting its tonic influence, whilst the essential oil of the aromatic acts as an excitant. Care, however, must be taken to discover, whether the symptoms are really produced by atony, for there is a variety of dyspepsia—indicated, at times, by pain of the epigastrium on pressure; by uneasiness, when hot or cold fluids are taken,—dryness and redness of the tongue; dryness and heat of skin, with sometimes quickness of pulse,—which consists, as the symptoms sufficiently indicate, in an irritated or inflamed condition of the gastro-enteric mucous membrane, and where, of course, the stimulant plan of treatment would be extremely injurious. This very condition of mucous membrane may, indeed, be induced by the incautious use of excitants. I have already remarked, that excitation is followed by corresponding collapse; and that excitants, in an over dose, exalt the vital energies of the part with which they come in contact to an inordinate degree; and, if this course be persevered in, the irregular condition of the mucous surface—as to alternate excitation and depression—cannot fail to eventuate in irritation, if not in true inflammation. All this is well understood by the instructed Therapeutist, and he, therefore, rarely has recourse to stimulants alone, in affections of the digestive tube, unless for the removal of sudden attacks of disease, as of flatulent colic, especially in children, when a few drops of any essential oil will often remove the mischief, in the manner previously explained.

In persons of the gouty diathesis, and occasionally in others, violent attacks of a spasmodic character affect the stomach, causing the most excruciating pain, aggravated at intervals, but with no signs whatever of inflammatory excitement. In such cases, a new action must be produced in the nerves of the organ, by the administration of the most diffusible excitants—combined,

or not, with narcotics—until relief is procured. The latter class of remedies afford us the most efficacious agents in these affections, and, accordingly, more trust is reposed in them; and it is surprising what large quantities of potent agents may be administered, under such circumstances, before relief is afforded. Ginger, capsicum, ammonia, ether, &c., are the excitants usually had recourse to in these cases; and the effect of the internal administration of excitants is often aided by the application of stimulants to the epigastric region, which operate also by exciting a new action in the nerves with which they are placed in contact, and thus detracting from the spasmodic condition of the nerves distributed to the stomach. This kind of revulsive impression or of new action we shall find to be the main cause of the good effects derived from the administration of the pure antispasmodics in diseases of a spasmodic nature.

In cases of great irritability of the stomach, especially in the vomiting of pregnant females, which sometimes proceeds to a distressing extent, a genial effect is produced on the stomach, by the new action, which gentle excitants occasion. Even the mild stimulation, afforded by the carbonic acid contained in soda water, or extricated during the effervescence, produced by the union of the tartaric acid and the carbonate of soda, often affords marked relief; and, in the worst cases, the exhibition of diffusible excitants, with the application of a sinapism or other excitant externally, hardly fails to palliate—if not to radically remove—the irritability of the organ, where it is functionally deranged only; for, it need scarcely be said, that where organic mischief exists; where inflammation, or the consequences of common or specific inflammation, are present, and are the cause of the inverted action of the stomach, these agents will not only fail in affording relief, but may be positively noxious, at least when exhibited internally. In these cases, the efforts of the practitioner are restricted to the use of narcotics as palliatives, and the external application of excitants as counterirritants.

In like manner, in cases of constipation, unattended with inflammation, and, on the contrary, accompanied by great torpor of the digestive function, the addition of an aromatic excitant to the cathartic is beneficial, by stimulating the muscular coat through the excitation induced in the mucous coat, whilst, moreover, it may act as a corrigent to the cathartic if the latter

has any griping quality, by aiding it in its passage through the intestinal canal, in the mode already described.

It need scarcely be said, that the use of excitants must be invoked with extreme caution in fevers. At one time—as I have already remarked—the great indication, in these affections, was supposed to be,—to obviate the tendency to debility and death, and, accordingly, antiphlogistics, especially of the depleting kind, were used with extreme caution, and every thing was done to husband the strength so as to permit the patient to bear up in the last stages. A better system of medical philosophy fortunately now prevails, and it is universally admitted, that few, if any, die from febrile debility, and that the fatal influence is seated in the over-irritation of some tissue, under which the patient gradually succumbs.

The efforts of the practitioner are, therefore, properly directed to the prevention of irregular action in organs, and to the removal of irritation or inflammation, wherever existent, and, under this philosophical treatment of fever, excitants are, of course, never employed during the early periods, and it is only when the powers of life begin to flag, that a question arises as to the propriety of their adoption. Even in the very lowest stages of the worst grades of typhus, this question is not always very easily settled. There is generally more or less local irritation present—often in the lining membrane of the stomach and intestines—and many of the signs of debility are dependent upon the depressing influence exerted on other functions by the predominance of irritation there.

We often observe this depressing influence singularly evinced in the sanguiferous system in diseases of the intestinal canal, especially such as affect the lining membrane. My friend, Professor Smith, of the university of Maryland, and myself attended, some time ago, one of the students of the university, who, after having been present at the lecture of the Professor of Obstetrics, in the evening, was attacked with violent vomiting, but without any abdominal tenderness or other uneasiness. On the following morning, there was some slight tenderness on pressure, and the vomiting persisted. He was cupped over the abdomen, although neither the state of the pulse, skin, nor the other symptoms appeared to indicate inflammatory action. During the day, he gradually sank, and expired the same evening. On examining the body, a portion of the ileum was found contracted for the space of several inches, but this contraction must have been

forming gradually. The lining membrane exhibited but slight signs of irritation; yet the cause of death was, doubtless, seated in this portion of the economy; and the only way we can account for it, is by invoking the intimate and extensive sympathy which exists between this part of the frame and the great centre of the sanguiferous system, so that a slight irritation there may produce marked depression, and even arrestation of the circulatory function. There is something, however, extremely unaccountable in these cases. The peristole of the digestive tube is but indirectly influenced by the brain and spinal marrow. Its functions appear to be principally carried on under the influence of the ganglionic nerves. The heart itself is equally abstracted from direct cerebro-spinal influence, and, indeed, from almost all nervous influence;* yet, in enteritic irritation, we find the whole circulatory apparatus oppressed, as it were; and this oppression, if not removed, rapidly terminating in depression; whilst, in the comparatively harmless disease—*tonsillitis*, or inflammatory sore throat—the action of the heart is inordinately excited, and the whole vascular system is thrown into violent agitation.

It is generally considered proper to have recourse to excitants in fever, when the pulse becomes feeble and fluttering; the tongue moist perhaps, but with a dark fur; the teeth covered with sordes; the skin bathed in a cold, clammy sweat; or, if hot and dry, with concomitant symptoms of debility; with sinking down in the bed, and low muttering delirium; the tongue tremulous, and protruded with difficulty,—indicating great debility of the nervous system; petechiæ or vibices, produced by transudation of the blood through the loosened parietes of the vessels, &c., &c. But it is impossible to lay down any positive rules for the guidance of the practitioner, and it is better, that he should even allow the signs of prostration to become marked, before he passes to the too early use—as it may prove to have been—of excitants. Dr. Rush, as I have before remarked, considered, that there was a period in fevers, at which blisters might be applied as stimulants with great advantage; but, if used before this period they would be productive of mischief. It is obviously, however, impossible to fix upon any such point with accuracy; and in this, indeed, the main difficulty rests. If it could be decided on by any specific signs, it would be but necessary to apply the antiphlogistic or the stimulating medication

* ‘Human Physiology,’ First Edit. ii. 133, and Second Edit. ii. 144.

accordingly. Vesicants are, however, by no means the best agents to be employed as excitants. In the low conditions of the frame, in which they are conceived to be indicated, the discharge of a large quantity of the serous part of the blood cannot fail to add to the debility more than the excitant property can detract from it; whilst they produce excessive irritation, and are, withal, transient in their operation. A more permanent excitant is, therefore, better adapted to these cases; and internal stimulants—as wine—are preferred, the quantity being carefully regulated so as not to stimulate beyond the due degree.

Under another head, we shall see, that epispastics may be employed with decided advantage in fever, but not with the view of inducing general excitation.

Whenever stimulants are esteemed necessary in fever, the fact before adverted to must be borne in mind, that their operation is apt to be followed by corresponding depression. They should be administered, consequently, so frequently, that the depression has not time to intervene, care being taken, that they are not given in such doses as to excite beyond the proper point; and, if their operation be salutary, they will be found to detract from, rather than add to, the febrile irritation; if, however, the febrile symptoms should be manifestly increased under their administration, they must be discontinued—but discontinued gradually—for the reasons just mentioned.

These general views will afford some guidance to the practitioner in the use of excitants in febrile complaints in general. I have already said, that in such affections they are but little needed, and that they must, in all cases, be employed with a wise caution. The case, indeed, must be sufficiently hopeless, in which the elasticity of the frame is incapable of restoring it to its wonted energies without their agency; and very often—too often—when they are determined upon, they occasion, at the most, a slight flickering of the flame prior to its total extinction.

What has been said of the impropriety of excitants in febrile affections applies equally to inflammatory diseases. It need hardly be said, that they are positively improper in all acute inflammations of internal organs of whatever kind. This, at least, is a general rule to which we ought to be cautious of admitting exceptions. Some surgeons are in the habit of administering the *copaiba*, and the *cubebs*, during the most inflammatory periods of gonorrhœa virulenta, and, they assert, with full success. In the experience of others, these agents have not been as suc-

cessful, or as innocuous. Something may depend upon the peculiarity of the inflammation of mucous membranes to which I have referred, and shall have again and again to advert. My experience in these cases, and it has not been limited, leads me always to treat the disease by antiphlogistics, especially in its early stages, and I have always found the plan fully successful. There is, however, a condition in these *catarrhs*,—as the inflammations of the mucous membranes in general are often designated by the French pathologists,—in which excitants may be administered with signal advantage. It is when the violence of the inflammation has subsided, and when a discharge is still maintained, owing to the atonic or asthenic condition of the over-distended extreme vessels keeping up irritation in the vessels with which they are continuous. Accordingly, in the state of chronic inflammation of the intestines, constituting the latter stages of acute dysentery, or in the after stages of diarrhœa, excitants may occasionally be used with benefit; but here we generally have recourse to those that belong to another class of medicinal agents—the astringents. In bronchitis, too, especially, in the variety, which affects old people, and which was, at one time, called *catarrhus senilis*, excitants are employed with advantage, especially such as are inhaled, and in this way come in contact with the vessels affected.

The greater part of the class of expectorants—as admitted by Therapeutists—consists of true excitants, and hence they are highly improper, whenever there is much inflammatory action in the pulmonary organs. But this class—a class that can scarcely be received except as comprising indirect agents—will engage attention in due order.

Where hypertrophy or supernutrition of the heart exists,—as indicated by strong impulse, diminished sound, dull percussion, and other signs afforded by auscultation—excitants are of course improper. Modern pathology has shewn, that where such a condition of the heart is present, the tendency is laid to hyperæmia in the brain; and, hence, vertigo, depravation of vision, cephalalgia, &c., are its frequent attendants. There are, however, no morbid states of the heart, and none of the blood vessels,—except such as are indicated by over-distension of the subcutaneous veins, and but few cases of these,—in which excitants can be employed with propriety.

In some of the affections of the class neuroses of Cullen, excitants are often demanded, but they must be used with due cau-

tion. In hysteria, we frequently administer them for the purpose of exciting a new impression. The disease is manifestly of a nervous kind, and is usually dependent upon great excitability of the cerebro-spinal axis. The object of the practitioner is to break in upon this morbid irregularity of action by making a powerful impression elsewhere; and this he does, either by means of strong excitants, or by nauseous articles, which powerfully impress the gustatory nerves, and thus detract from the general nervous erethism, by localizing it, as it were. Some of the antispasmodics—as assafœtida, garlic, &c.—are excitant; they, consequently, act in two ways;—by the nauseous impression, and by the excitation which they produce in the stomach. Accordingly, we can understand that if garlic or assafœtida be thrown into the rectum, in a paroxysm of hysteria, when deglutition is suspended, it may arouse the individual to consciousness, and dispel the nervous symptoms;—its exciting property—the essential oil—producing a new action in the nerves of the rectum, and attracting the nervous influx in that direction. But this is not effected by any purely antispasmodic virtue, which the assafœtida or the garlic possesses: turpentine, mustard or any other stimulating substance, added to an enema, would have produced equally beneficial results.

In epilepsy, chorea, tetanus, neuralgia, &c., we have but rarely recourse to excitants, because the nature of the diseased action requires a more permanent medication, which tonics are better able to effect. There may, indeed, be cases,—as in every other class of diseases, in which they are generally to be avoided—that may require their administration; but all this must be decided by a reference to general principles.

Perhaps there is no neurotic affection, in which the whole train of symptoms would appear to suggest their administration more strongly than paralysis. The name* and the symptoms convey the idea of loss of power, and it might appear that in all cases the loss of power should be restored by the use of excitants. This cannot always be done with perfect safety. Paralysis is often, if not usually, induced by a hyperæmic condition of the encephalon, or of some portion of the cerebro-spinal axis; and although this state of hyperæmia may disappear, and the *resolutio nervorum*—as it was once called—continue; exci-

* From *παρὰ λυω*, 'I relax.'

tants, if incautiously exhibited, may endanger the recurrence of the hyperæmia, and thus give occasion to another attack of the disease. Of course, the nearer to the period of the paralytic seizure the greater the mischief likely to ensue from the incautious use of this system of medication.

Yet although the incautious use of excitants has to be avoided in cases of paralysis, their careful administration is occasionally productive of much benefit,—both in hemiplegia, paraplegia, and in cases of partial palsy, such as that caused by the poison of lead, for example. The whole class of epispastics is here much invoked. Electricity and galvanism, acupuncture, moxa, &c., are applied to rouse the paralyzed nerves to action; friction, too, is recommended along with the internal use of excitants,—such as affect the cerebro-spinal system more especially.

With this view, the *nux vomica*, and especially its active principle—strychnine—has been exhibited, and in a few cases apparently with partial success. When this energetic agent is taken for a due time, and in an appropriate dose, it occasions tetanic convulsions in the muscles to which the paralyzed nerves are distributed, and, consequently, seems well adapted for exciting a salutary stimulation in these cases. Too often, however, the cause of paralysis, seated as it is in the cerebro-spinal axis, baffles every effort for its removal, and is far beyond the reach of excitants—either internal or external. It ought not, indeed, to be expected, that the latter could have much influence. Friction, so often employed, blisters and other external irritants can only exert their primary action on the parts secondarily affected. In this way, the encephalon, it is true, may receive the excitant irradiations, but the effect cannot be great, and, accordingly, external excitants are not regarded as efficacious agents in these affections.

In the paralysis of the seventh pair of nerves—of the *portio dura* distributed to the face—as it is generally perhaps local—rarely encephalic—and therefore of comparatively favorable prognosis—the class of excitants may be invoked with much prospect of advantage.

In many cases of inflammation of a topical kind,—seated on the surface of the body, and affecting the skin more especially,—the application of excitants is often of most unequivocal efficacy. It has long been a custom to expose a burnt part to the radiation of heat, or to hot lotions, and the success of the recom-

mendation is often signal. Shakspeare alludes to the practice, and to the fancied law of the economy, in his '*Romeo and Juliet*.'

"Tut, man! one fire puts out another's burning:
One pain is lessened by another's anguish;
'Turn giddy and be holp by backward turning;
One desperate grief cures with another's languish.
'Take then some new infection to thine eye,
And the rank poison of the old will die."

ACT I. SCENE II.

In like manner, in paronychia or whitlow, especially when superficial, the pain and inflammation are relieved by lotions of hot alcohol or hot vinegar; and we have branches of the same *modus operandi* in the influence of capsicum and other stimulating gargles in inflammatory sorethroat;—of stimulating applications in *pernio* or chilblain; of hot lotions in mastitis; of the oil of lemon dropped upon the inflamed conjunctiva, &c. I have before attempted to shew, that in the inflammations of the dermoid system—cutaneous or mucous—as a general principle, the over-distended state of the capillary vessel predominates over the excitation of the blood vessel communicating with it,—that the capillaries are—to use the language of Andral*—in a state of asthenic hyperæmia, which occasions the motion of the blood through them to be retarded, and, at times, absolutely stagnated. Any thing, consequently, that will stimulate the over-dilated capillaries to resume their wonted calibre will remove the cause of the excited state of the vessels communicating with them, and will, consequently, put a stop to the inflammation. It is in this way that we account for the good effects of blisters in whitlow, and in cutaneous inflammations.

Occasionally, too, we use excitants to diminish the sensibility of particular nerves,—as in tooth ache. For this purpose, the strongest essential oils,—as the oil of origanum or the oil of cloves,—are introduced into the hollow of the tooth, so as to come in contact with the exposed nerve.

Friction is an excitant application, which is had recourse to, especially after the use of the cold bath, to excite reaction. It is also employed to arouse the action of the vessels of nutrition, so as to occasion the absorption of effused or secreted matter: but, in this point of view, its effect is sorbefacient, and will therefore engage attention in another place.

* 'Précis d'Anatomie Pathologique,' i. 40.

In the hands of the surgeon, excitants are valuable agents. He employs them for inducing a new action in indolent ulcers, and for exciting the action of the absorbents to take up parts, that have been deposited. It is with this view, that white sugar is blown into the eye, in cases of specks of the cornea. The same agent has likewise been recommended to be inhaled, finely pulverized, to aid in the disengagement of the adventitious membrane, formed in cases of diphtheritis of the mucous membrane of the trachea, constituting tracheitis or croup. For the same purpose, we shall find, certain astringents are employed in medicine.

Lastly;—to the class of ‘mental excitants’ belong certain emotions, whose effects on the economy are not less marked than those produced by physical agents.

It has been the custom to separate the various emotions, which we experience, into two divisions,—the ‘exciting’ and the ‘depressing,’—an arrangement, which, in some measure, expresses the effects on the system which they are respectively capable of inducing. There is, however, as Dr. Thomson—who is one of the first writers on the *materia medica*, that have referred to these agents—has properly remarked, a difference amongst the excitants in the degree to which they stimulate the different functions. Some excite but little, and their action is more permanent,—not followed by the depression, which supervenes on the use of the more powerful excitants. They, consequently, belong rather to the class of ‘tonics,’ where we shall consider them. The writer, just referred to, places, in the list of mental excitants, ‘joy’ and ‘impetuosity,’—emotions, which, all will agree, belong properly to this division of therapeutical agents.

There is not a general effect, which follows the administration of physical excitants, that they are not capable of inducing. It is obviously difficult, however, to have recourse to joy as a remedial agent. It has happened, that the communication of glad tidings has had the most salutary effect upon the hypochondriac, and the melancholic; but the remedy is not easy of application and the effect must be transient. Excessive joy may even arrest the functions of the brain, and there are many cases on record, in which death has followed so rapidly on the emotion as to suggest, that the same *ratio moriendi* might be invoked as in death from lightning;—the sudden shock to the nervous system being too great for the vital functions to withstand.

Allied to joy is a cheerful disposition,—‘hilarity,’ and its ac-

companionment, 'laughter.' Every Therapeutist has observed the aid, which such a disposition affords to the invalid, and the detriment where the patient is liable to the depressing emotions. At the same time, care must be taken not to allow the buoyancy of spirits to lead the individual into imprudence, and to indulge in mental excitement to too great a degree. The stimulus, communicated to the whole frame in this way, where there is a tendency to irregularity of nervous or vascular action, is apt to lead to hyperæmia in some organ, and in this way to induce unpleasant consequences. In febrile affections, and in the state of irritability, which occasionally exists for some days after delivery, the excitation, occasioned by exhilarating conversation, and the fatigue thus induced, react most injuriously in many cases; and the wise Therapeutist is careful to enjoin both mental and corporeal quietude, until the vital functions are more regularly exerted, and are less liable to be thrown off the track by excitant or other deranging influences.

When mirth is accompanied with laughter, we have, in addition to the excitant effects, derangements of another kind induced, provided the laughter be immoderate or unduly protracted. Laughing is a convulsive action of the muscles of respiration and of the voice. It consists of a succession of short, sonorous expirations. The air is first inspired, so as to fill the lungs. To this, short interrupted expirations succeed, caused by convulsive contractions of the diaphragm; and, in very violent laughter, the respiratory muscles are thrown into such forcible contraction, that the hands are compelled to be applied to the sides to support them. The convulsive action of the chest interferes with the circulation of the blood through the lungs: that fluid, consequently, stagnates in the upper part of the body, and the face becomes suffused.

From this explanation of the physiology of laughter, we can understand, how injurious it may be, when immoderately indulged, to those, who are predisposed to apoplexy, of which it is, in this way, not an unfrequent exciting cause. It is a symptom, likewise, in hysteria, and is apt to induce a paroxysm of the affection, if carried to too great a length; but, on the other hand, in cases in which the functions of the abdominal viscera are torpid; where asthenic dyspepsia is present; or constipation, arising from a like cause; or where the secretion from the liver is not properly effected, gentle laughter is a useful agent. It impresses a salutary succussion on those organs; excites them from their condition of torpor; improves chylosis, and the digestive

function generally; and is inservient to the due nutrition of every part of the frame. Hence the old proverb—"laugh and grow fat"—which, like most proverbs, is in some degree bottomed in reason.

Impetuosity, in which we include rage, or any sudden and intense mental excitation of any kind, acts like joy, which might, indeed, have been considered, with propriety, under the head of impetuosity. All the bad effects, described as likely to be induced by joy, may follow impetuosity; and many are the cases of chronic diseases of the heart and lungs, in which a sudden burst of passion has at once closed the earthly career of the sufferer.

We know, that although the heart does not appear to be directly influenced by either the brain or spinal marrow, its irritability is considerably affected by the various emotions, and when these are violent, and the organ is in a morbid condition, the effect on the irritability is so great, that the action of the heart may cease, and there may not be a sufficient degree of reaction for it to resume its functions.

Where the valves of the heart have been diseased—as indicated by auscultation and confirmed by dissection—I have known three or four cases in which the fatal event has occurred at once under the influence of powerful mental excitation.

Such are the chief therapeutical properties of the first class of medicinal agents—according to the classification adopted in this work—'Excitants proper.' The next class, which we shall consider, does not differ essentially in intimate operation from excitants. 'Tonics' are, however, capable, as we shall find, of being administered when excitants cannot without danger of injurious consequences;—occasionally, also, they are administered with excitants, when the object is to produce more stimulation than the pure tonics are capable of effecting.

TABLE

OF THE CHIEF EXCITANTS, AND THEIR OFFICINAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Æther Sulphuricus, <i>Sulphuric Ether.</i>	By distilling a mixture of alcohol and sulphuric acid.	.....	1 f. dr. to 2 f. dr.
		Spiritus Ætheris Sulphurici. (Æther Sulphur. rectific. O $\frac{1}{2}$, Alcohol O j.	1 f. dr. to 3 f. dr.
		Spiritus Ætheris Sulphurici compositus. (<i>Hoffman's Anodyne Liquor.</i>)	1 f. dr. to 3 f. dr.
Ammonia. <i>Volatile Alkali.</i>	.....	(Spiritus Æther. Sulphur. O j, Ol. Ætherei, 2 f. dr.	
		Aqua Ammoniac. (Made by distilling a mixture of muriate of ammonia, lime and water.)	m 5 to 20.
		Alcohol Ammoniatum aromaticum.	
		Spiritus Ammoniac aromaticus. <i>Sal Volatile.</i>	
		(Alcohol Ammoniat. O i.; Ol. Rorismarin. Limon. ana 2 f. dr.; Ol. Caryoph. Ol. Cinnam. ana dr. $\frac{1}{2}$	m 20 to 60.
		Aq. q. s. Distil a pint.	
		Spiritus Ammoniac Succinatus. <i>Eau de Luce.</i>	
		(Mastich. 3 dr.; Sp. rect. 9 dr. Ol. Lavand. m 14; Ol. Succiu. m 4; Aquæ Ammoniac 10 f. oz.	m 10 to 30.
Ammoniac Carbonas <i>Carbonate of Ammonia.</i>	By subliming from a mixture of muriate of ammonia and carbonate of lime.	.....	5 to 15 gr.
Assafœtida. (See table of Antispasmodics.)			
Brucina. <i>Brucia, Brucine.</i>	From the <i>Brucea antidysenterica</i> , or false Angustura; also from the <i>Nux vomica</i> and <i>St. Ignatius's Bean</i>.	.....	1 to 3 gr.
Camphora, <i>Camphor.</i>	From the <i>Laurus Camphora</i> , and the <i>Dryobalanops Camphora</i> , of Asia, by sublimation.	.....	5 to 15 gr.
		Aqua Camphoræ—Mistura Camphoræ. (Camphor 2 dr.; alcohol m 40; magnesiac 1 dr.; aq. distillat. O ij.; tere et cola per chartam.)	$\frac{1}{2}$ f. oz. to 2 f. oz.
		Linimentum Camphoræ—Oleum Camphoratun. (Camphor $\frac{1}{2}$ oz., Ol. Oliv. 2 f. oz. solv.)	
		Tinctura Camphoræ, Spiritus Camphoræ. (Camphor 4 oz.; alcohol O ij.)	m 5 to 60.
Capsicum, <i>Cayenne Pepper.</i> (The fruit of the <i>Capicum annuum.</i>)	.....	.....	5 to 10 gr.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Castoreum, <i>Castor.</i> (See table of Antispasmodics.)	From India.	Tinctura Capsici. (Capsic. 1 oz.; alcohol dilut. O ij.)	} m 20 to 60.
Cinnamomum, <i>Cinnamon.</i>			
(The bark of the <i>Laurus Cinnamomum.</i>)			10 to 20 gr.
		Pulvis Cinnamomi compositus, Pulvis aromaticus. (P. Cinnam. Cardamom. Ziugib. ana 2 oz.)	} 10 to 30 gr.
		Oleum Cinnamomi, (distilled)	m 5 to 10.
		Spiritus Cinnamomi. (Ol. Cinnam. pondere 5 scr.; sp. rect. 4½ lb.; aq. q. s. Distil a gallon.	} 1 f. dr. to 2 f. dr.
		Tinctura Cinnamomi. (Cinnam 3 oz.; alcohol. dilut. O 2.)	} 1 f. dr. to 4 f. dr.
		Tinctura Cinnamomi composita. (Cinnam. 6 dr.; cardam. 3 dr.; zingib. 2 dr. alcohol. dilut. O ij.)	} 1 f. dr. to 4 f. dr.
Copaiba, <i>Balsam of Copaiva.</i>	From S. America.	Pilulæ Copaibæ. (Copaib. 2 oz.; magnes. 1 dr. fiat massa in pilulas 200 dividend.)	} m 20 to 60. } No. 2 to 6.
(The juice of the <i>Copaifera Officinalis.</i>)			
Cubeba, } <i>Cubeb.</i>	From India.		
(The fruit of the <i>Piper Cubeba.</i>)		Oleum Cubebæ, (distilled)	½ dr. to 2 dr.
Guaiacum, } <i>Guaiac.</i>	From the W. Indies.		
(The concrete juice of the <i>Guaiacum Officinale</i>)			10 to 30 gr.
		Tinctura Guaiaci. (Pulv. Guaiac. lb. ½; alcohol O ij.)	} 1 f. dr. to 3 f. dr.
		Tinctura Guaiaci ammoniata. Pulv. Guaiac. 4 oz.; alcohol. ammon. aromat. O 1½.	} 1 f. to 2 f. dr.
			½ gr. to ¼ gr.
Hydrargyri Chloridum corrosivum, <i>Corrosive Sublimite. Oxy muriate of mercury.</i>	By subliming a mixture of purified mercury, sulphuric acid, and chloride of sodium.	Liquor Hydrargyri oxy muriatis. <i>Solution of oxy muriate of mercury.</i> (Hydrarg. chlorid. corrosiv. 8 gr. aq. distillat. 15 f. oz.; alcohol 1 f. oz.—f. oz. ¼ contains ½ gr. of the chloride.)	} 1 f. dr. to 4 f. dr.
Hydrargyri Chloridum mitis, <i>Mild chloride of mercury.</i>	By subliming a mixture of purified mercury, sulphuric acid, and chloride of sodium, in different proportions from the last. Also, by precipitation, from a mixture of the proto-nitrate of mercury with a solution of sea salt.		1 to 2 gr.
<i>Submuriate of mercury,</i>			
<i>Calomel.</i>			
		Pilulæ Hydrargyri Chlorid. mitis. (Hydrarg. chlorid. mit. ½ oz.; Pulv. g. Arab. ½ dr.; syrup q. s.—to be divided into 240 pills.)	} No. 1 to 2. 1 gr. in each pill.
		Pilulæ Hydrargyri Submuriatis compositæ. <i>Plummer's Pills.</i>	

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Hydrargyri Cyanu- retum, <i>Cyanuret or Cyan- ide of mercury.</i>	Pharmaceutically, from the red oxide of mercury and the ferrocyanate of i- ron.	(Hydrarg. Submur.; Antim. Sulphur. præcip. ana dr. 2; p. Guaiac $\frac{1}{2}$ oz.; sp. rect. f. dr. $\frac{1}{2}$.)	} gr. 4 to 10.
Hydrargyri Lini- mentum, <i>Liniment of Mercu- ry.</i>	From Ung. Hy- drarg. Adipis ana oz. 4; camphor oz. 1; sp. rect. m 15; aq. ammoniæ f. 4 oz.	.....	} gr. $\frac{1}{8}$ to $\frac{1}{4}$.
Hydrargyri Oxidum nigrum, <i>Black Oxide of Mer- cury.</i>	Pharmaceutically, from the mild chlo- ride and potassa.	.....	} gr. 1 to 5.
Hydrargyri Oxidum rubrum, Hydrargyri Nitrico Oxydum, <i>Red Oxide of Mer- cury, Red Precipitate.</i>	Pharmaceutically, from nitric acid and purified mercury, by the aid of heat.	.....	} Used only ex- ternally as a sti- mulant to ulcers
		Unguentum Hydrargyri Oxidi ru- bri, Unguentum Hydrargyri Nitrico- oxydi. (Hydrarg. oxid. rubr. in pulv. oz. 1; Ung. simpl. oz. 8.)	} Stimulant to ulcers, &c.
Hydrargyri Pilulæ, <i>Mercurial Pills. Blue Pills.</i>	From Hydrarg. pu- rif. oz. 1; conf. ro- sarum oz. $1\frac{1}{2}$; pulv. glycyrrhiz oz. $\frac{1}{8}$; f. massa.	.....	} gr. 10 to 20.
Hydrargyri Sulphu- retum rubrum, <i>Red Sulphuret of Mercury. Cinnabar.</i>	By subliming purifi- ed mercury and sul- phur.	.....	} Chiefly used in fumigation, in venereal ulcers of the throat.
Hydrargyri Un- guentum, <i>Mercurial Oint- ment. Blue Ointment.</i>	From Hydrarg. pur. lb. 2; adipis oz. 23; sevi oz. 1.	.....	} dr. 1, rubbed in, with the view of inducing sa- livation.
Hydrargyrum Am- moniatum, Hydrargyri Præci- pitatum album, <i>Ammoniated Mer- cury. White Precipitate.</i>	By precipitation, from a union of the corro- sive chloride of mercur- y, with muriate of ammonia, carbonate of potassa and water.	.....	} Only used ex- ternally.
		Unguentum Hydrargyri Ammo- niati, Ung. Hydrargyri præcipitati albi. (Hydrag. ammoniat. oz. 1; ung. simpl. oz. 8.)	} In ulcers and cutaneous affec- tions.
Hydrargyrum cum Calcis carbonate. Hydrargyrum cum creta, <i>Mercury with chalk.</i>	By rubbing Hyd. pu- rifiæ. oz. 3 with calc. carb. præparat. oz. 5.	.....	} gr. 5 to dr. $\frac{1}{4}$.
Hydrargyrum cum Magnesiâ, <i>Mercury with Mag- nesia.</i>	From Hydrarg. purif.; mannæ ana part. 2; magnes. carb. p. 1.	.....	} gr. 5 to dr. $\frac{1}{4}$.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Hydrargyrum Nitratum, <i>Nitrate of Mercury.</i> }	.....	Unguentum Hydrargyri Nitratis. <i>Citrine Ointment.</i> (Hydrarg. purif. oz. 1; acid nitric. f. oz. 11; solve et adde olei f. oz. 9; adipis oz. 3.) }	In cutaneous affections, ulcers, &c.
Iodinum, <i>Iodine.</i> (See Table of Sorbent-facients.)			
Nux Vomica, <i>Nux Vomica</i> <i>Bachelor's Buttons.</i> }	From India.....	Extractum Nucis Vomiceæ. (Nucis. vomicæ oz. 8; alcohol. dilut. O ij.;—evaporate to to a due consistence.) }	gr. 5. gr. $\frac{1}{2}$ to 4.
Olea Essentialia, <i>Essential or Volatile Oils.</i> }	.....	Oleum Anisi; <i>Aniseed oil.</i> ———Cajuputi; <i>Cajuput oil.</i> ———Cari; <i>Caraway oil.</i> ———Caryophylli; <i>Oil of Cloves.</i> ———Cinnamomi; <i>Oil of Cinnamon</i> ———Juniperi; <i>Oil of Juniper.</i> ———Menthæ piperitæ; <i>Oil of Peppermint.</i> ———Menthæ viridis; <i>Oil of Spearmint.</i> ———Pimentæ; <i>Oil of Pimento.</i> ———Succiui; <i>Oil of Amber.</i> ———Terebenthinæ; <i>Oil of Turpentine, &c. &c.</i>	m 5 to 10. m 5 to 15. } f. dr. $\frac{1}{2}$ to f. dr. 2.
Opium, } <i>Opium,</i> } (The concrete juice of the <i>Papaver Somniferum.</i>) (See Table of Narcotics.)	Chiefly from the Levant and from India.	(All the preparations of opium are excitant in a small dose. For the preparations, see Table of Narcotics.	gr. $\frac{1}{4}$ to $\frac{1}{2}$.
Piper, <i>Black Pepper.</i> } (The berries of the <i>Piper Nigrum.</i>)	From India.....	Confectio Piperis Nigri. <i>Ward's Paste.</i> (Piper Nigr. Inulæ ana lb. 1; sem. fenicul. lb. 3; mellis; sacchar. purif. ana lb. 2.) }	gr. 5 to 20. } dr. 1 to dr. 2.
Sinapis, <i>Mustard.</i> (The seed of the <i>Sinapis Alba</i> and <i>Sinapis Nigra.</i>)	.....	Chiefly employed in the form of cataplasm, or <i>sinapism.</i>	Internally, oz. $\frac{1}{2}$ of the entire seeds.
Strychnina, <i>Strychnine.</i> }	(From the <i>Nux Vomica</i> and <i>Bean of St. Ignatius.</i>)		{ gr. 1-16th to gr. 1-6th.
Zingiber, } <i>Ginger.</i> }	From the Indies.....	Syrupus Zingiberis. (Tinctura Zingib. f. oz. 2; syrup. cong.) }	gr. 10 to 20. } dr. 1 to dr. 2.
		Tinctura Zingiberis. (Zingib. contus. oz. 8; alcohol O ij.) }	m 20 to 60.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Alcohol,	From the distillation of vinous liquors..	Ardent spirits, Wines, Porter, Ale, &c.	
Caloric, .....	.....	Bath of air heated to 96 degrees and upwards. Water heated to 96 degrees and upwards artificially:—or the natural baths,—as those of Bath, in England (temp. 96 to 106 deg.); of Vichy, and Barege (temp. 120 deg.); of Aix-la Chapelle (temp. 143 deg.); of Carlsbad (temp. 165 deg.); of the Warm Springs (temp. 96 deg.), and Hot Springs (temp. 96 to 108 deg.) of Virginia; and many others. Vapour Baths. Hot topical applications, actual cautery, moxa, &c.	
Electricity, .....	.....	Aura, sparks, shock, &c. Galvanism, Galvanopuncture, &c.	
Mental emotions, (<i>Impetuous.</i>)			

SECTION II.

TONICS.

Tonics differ from excitants—The former defined—*Modus operandi*—Tone, and want of tone, on what dependent—Tonics, direct and indirect—Bitter extractive the great tonic principle of vegetables—Tonics given with two great views, to strengthen the system and to break in upon a morbid catenation—Therapeutical application of tonics—In febrile diseases—In inflammatory disorders—In the neuroses—Mental tonics.

THE excitants, considered in the last division, are diffusible in their action, and transient, therefore, in their effects,—the stimulation being followed by a degree of depression proportionate to the extent of such stimulation. They excite, therefore, beyond the healthy degree—beyond what at least may be considered as the regular standard. The substances, which are next to be investigated, operate silently and permanently. They are, therefore, followed by no undue depression, when discontinued; and they may be employed in states of the system in which the use of excitants proper might be questionable. Accordingly, when the practitioner is somewhat in doubt, whether the case before him will admit of stimulation, and yet the weight of evidence urges him to that course, he usually prefers commencing with a tonic—a slightly stimulating tonic—to beginning, at once, with the diffusible excitants,—knowing that the former may be discontinued without detriment, whilst the latter can only be cautiously pretermitted, especially if their employment has been persevered in for some time.

Tonics are usually defined to be—Agents, which give strength and vigor to the body. In this point of view, all strengthening aliments might fall under the division. They are, in reality, tonics; but, as I observed before, the consideration of aliments is not comprised in the objects of this work. It has been attended to in another place.*

* *'Elements of Hygiene,'* p. 205.

By many therapeutical writers, tonics have been conceived to act by improving the tonicity of the muscular system; and, in the classification of Dr. Thomson, they are separated from excitants proper, and classed with astringents, under the head of—‘Vital agents, influencing the body generally by operating directly on the muscular and sanguiferous systems.’ Yet, in a subsequent portion of the volume,* he affirms, that tonics “act on the vital principle through the medium of the nerves, and as far as their mode of operating is understood, we may regard them as excitants.”

To elucidate his ideas on the *modus operandi* of tonics, he has the following observations:—“When an individual is in good health and in vigor of body, the muscles or moving organs feel firm and tense; they act regularly and powerfully, whether they are involuntary muscles, or those under the control of the will. This is a state of *healthful tone*. On the contrary, when the muscles feel soft and flabby, when the action of the involuntary muscles is languid, and the voluntary do not rapidly respond to the will; when there is a strong inclination for rest and indulgence; and when the movements of the body or its parts are performed with difficulty, this is a state of *deficient tone* or *debility*. That both these states are connected with the condition of the muscular fibre may be demonstrated by detaching a muscle from the bodies of two animals, in these opposite conditions, and ascertaining its strength by appending weights to it: the muscle taken from the healthy animal, or that in a state of *tone*, will sustain a much greater weight than that which is in the opposite state. Thence, to a certain extent, *tone* implies a difference in the mechanical condition of muscles; a greater degree of density and cohesion of their component fibres; but this must be also joined with *elasticity*, that is, the power of resisting extension, and of restoring itself when the extending cause is removed, before the part can be said to be in the state of perfect tone. That this state is truly the result of vital energy is evident; for the same muscle loses the power of sustaining the weight, which it supported when first cut from the body, and this in proportion to the distance of time from that of its separation from the living body,—and he adds, “medicines, or medicinal agents, which produce this state of healthful tone, and renew *the tension* and vigor of the muscular fibre, are thence denominated *tonics*.”

Sir Gilbert Blane also asserts, that no muscle, whether volun-

* Op. cit. i. 629.

tary or involuntary, can act unless its fibres are previously in such a state, that if divided they would shrink by their own resiliency, leaving an interval between the cut extremities; and Dr. Paris*—after citing the above remark of Sir Gilbert's, observes:—"it appears, that there are certain medicinal bodies that have the power of affecting this state of tension, and when their effects contribute to its restoration, they are properly denominated *tonics*." Yet this resiliency, described by Sir Gilbert, is not even a vital manifestation exclusively. It may be independent of the vital properties. It continues for some time after the total extinction of life in all its functions; appears to be connected simply with the physical arrangement of the molecules; and is not affected, until the progress of decomposition has become sensible. Hence, it has been properly regarded, by Haller and others, as a *vis mortua*.†

Flexibility, extensibility, and elasticity are variously modified, and combined in the different forms of animal matter, and they exist, to a greater or less extent, in every organ. Elasticity is only exerted under particular circumstances. The tissues, in which it is inherent, are so disposed through the body as to be kept in a state of extension by the mechanical circumstances of situation, but, as soon as these circumstances are modified, elasticity comes into play, and produces shrinking of the substance. The gaping wound, produced by a cut across a cooked shoulder of mutton, is an example of this elasticity or resiliency, familiar to all. Previous to the division, the force of elasticity was kept neutralized by the mechanical circumstances of situation—or, by the continuity of the parts; but, as soon as this continuity was disturbed, or, in other words, as soon as the mechanical circumstances were altered, the force of elasticity was exerted, and produced recession of the edges. This property of elasticity has been called *contractilité de tissu*, and also 'tone' or 'tonicity;'—names, which have probably suggested the *modus operandi* assigned to tonics, that we have been discussing.

That such diminished cohesion, as that adverted to, may occur, as the result of disease, is doubtless. Pathology affords us many examples of it, although not as many as is usually supposed, and it is by no means easy to see, that such a pathological condition must always exist, when tonics are indicated, or whenever they prove beneficial.

The only way, it appears to me, that these agents can act on

* Pharmacologia, p. 73.

† Human Physiology, First Edit. i. 36, and Second Edit. i. 45.

the muscles, is on their contractility, like excitants, and indirectly on their nutrition, through the medium of the nerves distributed to the stomach ;—the irradiations being conveyed from thence to every part of the nervous system, and, therefore, to every portion of the frame endowed with nervous influence.

Want of tone appears to depend more—in the majority of cases—on exhaustion of muscular contractility, and on impaired nervous influx, than on any mechanical alteration in the condition of the muscle. Physiology and pathology afford us numerous examples in support of this position, but it will only be necessary to refer to a few.

The *cœnæsthesis* or ‘common feeling,’ of many people, is so much influenced by the condition of the atmosphere, that they become almost barometers ;—feeling light and buoyant when the air is clear and dense, and gloomy, when it is moist and light. Again, if the bowels be loaded, the powers of the system will be, at times, so depressed that general languor and lassitude will prevail, and the individual may be incapable of the slightest muscular exertion. In like manner, after continued exertion of muscles, fatigue is felt, and rest is absolutely demanded, until the exhausted excitability has been recruited ; and, lastly, if a man, previously in perfect health, be struck with the contagion of a malignant fever, he finds his strength dissipated, and that he is incapable of raising as many ounces with the flexor muscles of his arm, as he, a short time previously, could raise pounds. In none of these cases, can we presume, that the mechanical condition of the muscle is changed. In the cases of the varying atmosphere, the loaded bowels, and the impression of malignant fever, the feelings of debility must be regarded as wholly dependent on the condition of the nervous system ; and in that of great fatigue after protracted exercise, on the exhaustion of the muscular contractility under the perpetual excitement produced by the repeated efforts of volition ;—the nervous influx exhausting the muscular contractility or excitability precisely like any other stimulus.

We see, also, how strongly the want of tone is connected with the state of the nervous system, in the depressing influence of nostalgia, or ‘homesickness,’ where every voluntary function is carried on in languor and asthenia ; and, on the other hand, we are equally struck with the evidences of strength, which the maniac exhibits. In such cases, we find the delicate muscles of the female executing feats, which the largely developed muscles of the athletic male would be incapable of accomplishing—under

the ordinary or healthy nervous influx. The effects, too, of those mental tonics, to which I shall have occasion to refer, must manifestly be exerted on the brain, in the first instance, and, through the medium of the nerves, on the rest of the body.

Under this salutary nervous excitation, which tonics are capable of effecting, the action of the capillaries over the whole system becomes augmented; nutrition is increased, and the *vis in-sita* is screwed up to the healthy standard.

It is probable, that all tonics are obscurely stimulant; but they differ, as I remarked before, from excitants proper, in not stimulating to a marked degree, and in the excitation not being followed by corresponding depression.

True tonics exert no perceptible stimulation; their action, though efficacious, is silent; and, if they be repeated at proper intervals, a permanent, healthy state of tone is induced. But all this, as I have attempted to shew, is produced through the agency of the tonic upon the nervous system, and there does not appear to be any satisfactory reason for believing, with Dr. Chapman, that tonics, "like every other class of medicines, are endowed with some properties peculiar and distinctive, among the most conspicuous of which is their specific affinity to the muscular fibre."*

Tonics may be either direct or indirect;—that is, they may be the means of directly adding to the healthy tone of the system, in the mode I have described; or, in particular conditions of the economy, other substances—belonging to different classes of the *rapeutical* agents—may indirectly exert a tonic effect. In this way, bloodletting, cathartics, emetics, &c., may be indirect tonics. In the state of apparent debility, which accompanies febrile or other irritation, and in that in which the stomach or intestinal canal is loaded, and the nervous system oppressed and depressed, a remedy, which will obviate these conditions, will remove the debilitating effects of such conditions, and prove tonic. When, however, we use the term 'tonic' abstractedly, we never apply it to those indirect agents.

It has been a question, occasionally agitated by Therapeutists, whether there be any such thing in nature as a real tonic; or, in other words, whether any remedial agent can, by virtue of properties inherent in it, communicate tone where tone is defective. It appears obvious, that no such properties are possessed by any agent; or, in other words, that no principle is infused into an as-

* Op. citat. ii. 256.

thenic organ or tissue, which can give strength to it. The whole effect is exerted, directly or indirectly, on the nerves of the stomach; whence it irradiates, by means of the nerves, to every part of the system. It is probable, too, that some of the articles of the class are absorbed, and act upon the organism through the altered character of the blood in the capillary bloodvessels. Such, it has been conceived, is the *modus operandi* of the preparations of iron in chlorosis and other affections. Some tonics, again, are insoluble, and pass, apparently unaltered, through the digestive tube, appearing to exert their influence like condiments—certain of them at least—which contain no nutriment, but place the chylopoietic organs in a condition for deriving a larger amount of nutriment from alimentary matters taken along with them than they would otherwise have been able to accomplish.

When a tonic is administered in disease, its speedy operation is not to be expected. This is one of the essential points of difference between tonics and excitants proper. The effects are gradually, and almost insensibly exhibited; and they afford us as good specimens of the action of what have been termed ‘alteratives’ as any that could be selected. They produce no sensible evacuation. Under their employment, the appetite gradually improves; the impressibility of the nervous system—often induced by long protracted indisposition, or by a rapid reduction of the vital forces, as in acute diseases—lessens; the action of the circulatory system assumes the healthy standard; the general feeling exhibits itself buoyant and elastic; and the muscular powers, under the improved nervous influx, resume their wonted energy; but all this denotes only a restoration to the healthy standard, whilst excitants always carry the organic actions beyond the regular state. Hence, the great use of tonics in convalescence, although even if administered in conditions of the system in which they cannot be expected to produce good, they are devoid of the injurious consequences, that may follow the undue use of excitants proper, and their administration may be arrested at any moment, without fear of debility resulting. I have already said, that it is the use of diffusible stimuli, which is alone followed by corresponding depression.

Bitter extractive appears to be the great tonic principle of most of the vegetable tonics; aided, in some, by the presence of aromatic oil—which forms a more stimulating tonic,—in others, by the presence of one or both of the great astringent principles of vegetables. This bitter extractive is not affected by heat; but the aromatic oil is, provided the boiling temperature be applied

for some time. Decoction is, therefore, an improper mode of preparation, where the object is to retain the aromatic property.

Infusion is the form most commonly prescribed, and hence, in the pharmacopœias, we have officinal infusions of all the principal vegetable tonics.

Dr. Thomson asserts,* that Dr. Chapman, and—following him—Dr. Paris, attempts to prove, that bitterness is essential to all tonics; or, in other words, that it is the tonic principle; but on this he does those writers injustice. The latter gentleman† affirms, that the tonics, derived from the vegetable kingdom, are *generally* bitter;—whilst the former expressly says:—“Concerning the element, which gives the tonic power, some difference of opinion has been entertained. Cullen supposed it to be the same quality as that of bitterness. But though it holds to a considerable extent, there would seem to be no necessary connexion in all cases. Exceptions at least are not wanting, as we see very strikingly in opium and digitalis, which are bitter, though not tonic; and, conversely, in many of the metallic articles, which, though tonic, are not bitter in the slightest degree.”‡ Nor do we think Dr. Thomson more accurate in his opinion, “that part of all the vegetable tonics are (is) digested in the stomach, and the principle, whatever it is, which produces their tonic influence, is thus separated from the other parts; and consequently it is enabled to act with more energy upon the nerves of the stomach.” This explanation can scarcely apply to infusions of vegetable substances, and still less to the active principles of such substances; nor can it well apply to them when given in the solid form, as in the state of powder, in which the active principle is combined with little more than lignin or woody fibre, in many cases. It is but necessary, that the fluids of the stomach, or any fluids, should come in contact with the substance in order to extract its tonic virtue, but nothing like digestion—as applied to the physiological process to which alimentary matters are subjected—is necessary.

Bitter extractive, as Dr. Paris has remarked, is a great natural tonic. It appears to pass through the body without suffering any diminution in its quantity, or change in its nature. No cattle will thrive upon grasses, which do not contain a portion of this vegetable principle; a fact, which is considered to have been proved by the researches of Mr. Sinclair, gardener to the Duke

* Op. citat. i. 635.

† ‘Pharmacologia,’ p. 80.

‡ Op. cit. ii. 256.

of Bedford, in his '*Hortus Gramineus Woburnensis*,' where he remarks, that if sheep be fed on yellow turnips, which contain little or no bitter principle, they instinctively seek for, and greedily devour any provender, which may contain it, and if they cannot obtain it, they become diseased, and die. "We are ourselves conscious," Dr. Paris adds, "of the invigorating effects of slight bitters upon our stomach; and their presence in malt liquors not only tends to diminish the noxious effects of such potations, by counteracting the indirect debility, which they are liable to occasion, but even to render them, when taken in moderation, promoters of digestion. The custom of infusing bitter herbs in vinous drinks is very ancient and universal: the *poculum absinthiatum* was regarded in remote ages as a wholesome beverage, and the wormwood was supposed to act as an antidote against drunkenness. The Swiss peasant cheers himself amidst the frigid solitude of his glaciers, with a spirit distilled from *gentian*, the extreme bitterness of which is relished with a glee, that is quite unintelligible to a more cultivated taste."

Tonics may be given with one of two views;—either to make a decided impression on the nervous system, so as to break in upon a chain of morbid phenomena that supervene in paroxysms,—as in intermittent fever,—or to produce their silent but permanent operation for the removal of debility. The same form of preparation is not equally adapted to the two cases. In the former, the lignin or woody matter of the vegetable may not be objectionable. On the contrary, it may assist the operation of the tonic principle, by exciting a new action in the nerves of the stomach; but, where the powers of the system—and of the digestive organs as a part—have been prostrated by long protracted indisposition, the vegetable tonics cannot be administered, with propriety, in powder, as they are apt, by reason of the indigestible woody matter, to occasion great derangement of the stomach and bowels, and sometimes irritative fever. At other times, the bark will accumulate in such quantity, in the alimentary canal as to be discharged, for several days consecutively, by the bowels.

In a case of this kind, which fell under the author's care some years ago, the most disastrous results were produced—apparently by the irritation, excited in the system by the presence of this extraneous substance in the bowels. A young lady, of markedly scrofulous temperament, and predisposed somewhat to pulmonary consumption, was attacked with bilious fever, which was actively treated, and, in the course of three or four weeks, yield-

ed: the debility, however, was so great as to induce the practitioner to prescribe a tonic; and the cinchona was selected, and administered in powder. After she had taken it for some days, vomiting and purging occurred, accompanied with occasional chills of the most distressing character. Bark was discharged in quantities in the evacuations; and, under the irregular actions thus excited, tubercles—already probably present in the lungs—inflamed and suppurated, and this most rapidly; hectic fever, and every symptom attendant on the confirmed stage of pulmonary consumption, supervened, and she gradually sank under the malady;—yet, no signs of phthisis were present, prior to this derangement produced, by the bark in powder on a frame, already debilitated by the previous malady.

Where the object of the practitioner is simply to strengthen the debilitated gastric functions, the powdered tonics should not, consequently, be chosen. Modern chemistry has presented some valuable gifts to Therapeutics, by separating the active principles from several of the tonics; and where this has not been done, simple infusion will extract all their virtues. The watery infusion is perhaps the best preparation;—the spirituous combining an excitant principle, which may not always be indicated, where tonics are; and it is well, where their administration has to be persevered in for a length of time, that the tonic should be varied. The system soon becomes habituated to the same agent; and, if another be substituted in its place, for a few days, the use of the former may be resumed with its pristine advantage.

In the therapeutical employment of tonics, it is important to inquire, whether some may not be better adapted for fulfilling the indications, that may suggest themselves, than others. Certain of the articles are simple bitters; others are combined with some acrid or astringent component, whilst others, again, are associated with volatile oil &c.

In febrile diseases, tonics cannot, as a general principle, be often needed. Accordingly, they are not now much employed. The remarks, that have been made regarding the use of excitants in fevers, are applicable to tonics, except, that the latter do not stimulate as much as the former, and, when cautiously used, do not excite beyond the healthy standard. Simple tonics can, therefore, be commenced with, when excitants might be of doubtful propriety; and if the symptoms do not improve under their

administration, they can be discontinued at once, without any apprehension of the evil, that supervenes on the sudden discontinuance of excitants—the prostration, which corresponds to the previous excitation. The vital elasticity is generally sufficient to restore the patient from the depression induced by fever, and when it is not, the use of excitants—and the same may be said of tonics—will not be found effective. The practitioner, however, will never hesitate to have recourse to them in those malignant forms of typhus, sometimes met with in jails, camps, and in the filthy, unventilated houses of the poor, in some countries, as well as in every fever, whose symptoms approximate to such a condition. The sulphate of quinine, in the state of a super-sulphate, formed by the addition of a few drops of sulphuric acid, is one of the most common agents invoked in these cases ; although the watery infusion of many of the tonics,—as columbo, and gentian—is often recommended.

In the apyrexia of intermittents, tonics are our sheet anchors, to which we trust implicitly. Their mode of operation, in preventing diseases characterized by periodicity, is by no means clear. The only theory we can form is, that they produce a new impression upon the nerves of the stomach, and through them on the nervous system generally ; and that the new action, thus induced, is sufficient to break in upon the morbid chain that had been established. This view is, at least, strengthened by the fact, that a powerful emotion has been found to produce a similar effect with the tonic ; has completely prevented an expected attack ; and, even after its inception, has removed it. Accordingly, fear is ranked, by many practical writers, amongst the ‘febrifuges,’ to be employed in ague ; and the efforts of the tractorizer, and the animal magnetizer exert their influence in the same manner.

It is not easy to explain this effect on the mind, or indeed the action of any of the class of tonics, under the idea, which Broussais entertains of the pathology of intermittents ;—that they are intermittent gastro-enterites. “Every regular paroxysm of intermittent fever,” he remarks, “is the sign of a gastro-enteritis, the irritation of which is afterwards transferred to the cutaneous exhalants, which produce the crisis.”—(Prop. cexxiii.)* Yet this state of gastro-enteritis is removed, and prevented by agents,

* ‘Principles of Physiological Medicine,’ &c.; translated by Doct’s Hays and Griffith, p. 443.

which would scarcely seem appropriate for such a result;—for example, by the peppers, as well as by the whole class of aromatic tonics. Most of the observations of Broussais on the subject of intermittents exhibit the dogmatism, which too much characterizes all his writings. In proof of this I need only adduce his views regarding the production, and cure of ‘obstructions,’ arising in the course of intermittent fever,—views which are far removed from the precision of investigation and deduction, that ought to be expected from a doctrine, which has been termed, *par excellence*, ‘the physiological,’ and which has been captivating, with many, by the categorical manner in which its precepts are conveyed, rather than by their soundness.

In his 384th Proposition, M. Broussais remarks:—“Bark and stimulants, administered whilst there remains any inflammation of the *primæ viæ*, increase the phlegmasia to an acute and continued form, or they stop the paroxysms, and keep up the disease in a chronic form: then, irritation and congestion fix themselves in the parenchymatous viscera. It is in this way, that the bark produces *obstructions*, which are subinflammations.” Again,—“Intermittent inflammations, abandoned to nature, are spontaneously cured when they are slight, and the causes producing them cease to act: under opposite circumstances, they are either aggravated into acute continued inflammations, or they degenerate into a chronic continued form, which continues until its termination in *obstructions*, and dropsy.”—(Prop. cccxxxv.) and lastly;—“*obstructions* of the parenchymatous viscera, (the liver, spleen, and lungs,) sometimes supervene on intermittent fevers, without the inflammation of the gastric mucous membrane becoming continued: they are then cured by the bark given during the apyrexia.”—(Prop. cccxxxvi.)

In support of these positions, which are advanced as if they were invariable and incontestable statutes, M. Broussais offers no argument, although they may all admit of dispute; and the very basis of his doctrine of intermittents—that they are periodical inflammations—rests on no sufficient foundation. Nor, it will be observed, are his propositions consistent with each other, although it might appear so easy to make them so, where conclusions are so readily attained. But, whatever objection may be made to his pathological views on the subject of intermittents, his treatment is rational. It is, indeed, exactly that, which experience has shewn to be most satisfactory. Intermittents, it is known, may wear themselves out; but it is a long and a tedious process. Antiphlogistics simply have been found to have no ef-

fect in breaking in upon the morbid chain. However useful they may have proved in lessening the duration of one of the stages of the paroxysm, they do not prevent the recurrence of the attacks. The employment of vegetable or mineral tonics is demanded, if the object of the physician be—to put an end at once to the disease. The following proposition conveys aphoristically the ordinary treatment in intermittent fever,—a treatment, which is sanctioned by the experience of ages, and is no emanation from the ‘physiological doctrine,’ but rather opposed to its inculcations. “The surest method for the certain cure of inflammations with periodical exacerbations, is to treat them at first by antiphlogistics during the hot stage, so as to render the apyrexia complete; to continue this treatment after the paroxysm, if the apyrexia be not complete: to give the cinchona, or rather the sulphate of quinine, and the other tonics during the whole apyrexia; to administer diffusible stimuli at the accession of the rigors, and to return afterwards to cooling drinks when the hot stage is developed.”—(Prop. ccclxxxiii.)

It is only, however, when the apyrexia is complete, that tonics can be administered, with full advantage, for the cure of intermittents. If plethora exists, or if there be hyperæmia in any organ, these must be removed, before the tonic febrifuges are had recourse to; unless, indeed, in those old obstructions of the parenchymatous viscera, which occasionally present themselves as evidences of former attacks of malarious disease. In the pernicious intermittents, too, which prevail in some countries to so great an extent—as in the Maremma district of Italy, and in some parts of this country—the cinchona seems to be required, before there is a complete apyrexia, for the purpose of arresting, as early as possible, paroxysms, which might prove fatal, by virtue of the irregular actions—the asthenic hyperæmiæ which they are apt to induce in important organs. It happens fortunately, that in these cases, there does not appear to be as much mischief induced by the premature administration of the cinchona, or its active principle, as is often apprehended, although M. Broussais, in the propositions cited, has depicted some of the evils, which he considers likely to be produced by it. There are many observing practitioners, who have administered the cinchona—even in substance—a form in which it is most likely to disagree, in consequence of the quantity of insoluble woody matter—and who have been satisfied, that it has not added even to the intensity of the hot stage. Still less would this be likely to accrue from some of the more advisable forms of preparation.

I have often administered the cinchona in powder and in moderate doses, both in the healthy and moderately excited state of the system, but without observing, that any augmentation of action has been induced by it. With some individuals, the quinine does produce unpleasant effects, but its stimulation appears to be mainly directed to the nervous system; great cephalalgia is induced; and a high state of impressibility and vascular excitement may, and occasionally does, supervene, notwithstanding the opinion of M. Hensler, who esteems cinchona, and its active principles, to be ‘tonico-paregoric.’ But, M. Broussais does not regard excitants even as highly prejudicial, when administered during the hot stage of an intermittent. “Intermittent fevers,” he says, “are *rarely cured* by stimulants administered during the hot stage: this method of treatment rather tends to make the inflammation continued or remittent.”—(Prop. cccclxxx.) The singularity is, that if, according to his view, they be gastro-enterites, they should *ever* be cured by stimulants!’

It is a good general rule to lay down, that, prior to the administration of tonics, all local mischief should, if possible, be removed; for, even should these agents not augment the mischief, they cannot exert the necessary sanative influence upon the morbid catenation, which keeps up the fever.

Remittent fevers have to be regarded much in the same light as the continued, in respect to the administration of tonics. Whilst the febrile irritation is nearly constant, or whilst there is no period, in which fever is nearly, if not wholly, absent, they cannot generally effect a cure. The nearer the remittent approaches to the intermittent, in its character, the more beneficial will be the action of tonics. During the strongly inflammatory period of the disease, antiphlogistics have to be relied upon exclusively; and as there is generally a strong disposition to hyperæmia in some important organ, during the continuance of the irregularity of functions, which characterizes the remittent forms of fever, antiphlogistics have to be pushed to a greater extent than in cases of simple fever. There are cases, however, of remittent fever, occurring in highly malarious districts, which demand the use of the bark comparatively early;—the disease, from the first, not exhibiting any highly phlogistic character, and being apt to be attended with engorgements of internal organs, unless interrupted in its progress at an early period. In such cases, bark, or its active principle, has been found effectual; and as a general principle, the evidences of vascular excitement, and

of local engorgements should be got over, before tonics are administered.

It need scarcely be said, that tonics are not indicated in inflammatory disorders, unless it be in those forms, and stages, in which excitants may be advisable. It has, however, been maintained, by men of no small distinction in science, that they may be given with advantage in every stage of erysipelatous inflammation, as well as of acute rheumatism. So far as my experience goes, these affections differ somewhat according to the climate, or locality in which they occur; and hence the diametrically opposite views of treatment, at one time inculcated in London and in Edinburgh;—the antiphlogistic medication being universally adopted in the one place, whilst the tonic was as universally had recourse to in the other. Much also depends upon the habit of the individual,—whether natural, or induced by intemperance, &c. In the latter case, the inflammation may be of, what is termed, the most unhealthy character: typhoid fever may attend, and at times, indeed, every sign of typhus, with tendency to gangrene. In such a condition of the system, tonics are indispensable. The practitioner must, however, be always guided by the symptoms that present themselves, and by the nature of the lesion, in this way indicated; and if he practises soundly, he will find, that, occasionally, it is requisite to push antiphlogistics considerably, whilst, at other times, the indications may be, to be equally active with tonics. The facts, in this case, again, have shewn, that tonics, although they may not be productive of advantage, may still be administered with impunity.

The remarks, made on erysipelas, apply generally to acute rheumatism, which is essentially arthritis, or an inflammatory condition of the fibrous structures surrounding the joints, accompanied by the singular anomaly,—that the skin, instead of being hot and dry, as in other fevers, is usually hot and bedewed with copious perspiration. In such case, tonics have been largely exhibited, and have been looked upon, by some practitioners, as more beneficial, from the commencement even, than antiphlogistics. I have had numerous opportunities for witnessing the exclusive use of both these modes of treatment, and although I cannot agree, that the tonic medication has been the best, I do not recollect having seen the symptoms, in a single case, aggravated under their prudent administration.

A combination of the two modes has appeared to me as advantageous as any other;—treating the disease, during the earlier period, by the ordinary antiphlogistics, and afterwards endeavouring to modify the condition of the nervous system by the cautious employment of tonics, such as the sulphate of quinine with sulphuric acid. The whole disease is peculiar. It is not dangerous whilst the joints remain chiefly affected: and it only becomes so by the extension or translation of the rheumatic inflammation to more important organs. It has been the opinion of many eminent observers, that copious depletion favours this extension, or metastasis, but proof is wanting. In our uncertainty, however, it is advisable not to be too officious, where, as I have already remarked, the disease is not situated in parts of vital importance, and usually terminates favourably, except under the supervention of the accidents just mentioned.

As, in inflammatory diseases, gentle tonics are manifestly contra-indicated, so are they in the active forms of hemorrhage, the management of which is essentially that adapted for inflammatory disorders; but in the less active varieties,—in those that have been termed ‘passive,’ and in which there is loosened cohesion of tissue, and perhaps modified spissitude of the blood, so that it readily transudes through the coats of the vessels,—the aid of all the general excitants,—excitants proper, tonics and astringents—may have to be invoked. Tonics, on this principle, are employed in scurvy, and in febrile and other affections, accompanied with strong evidences of a passive hemorrhagic tendency.

Many of the neuroses, being accompanied by considerable debility and mobility of the nervous system, require the employment of tonics. This is the case with epilepsy, which is more frequently dependent on this condition of the nerves than on any inflammatory state of the system. Not unfrequently, however, the disease is organic in its nature, or, in other words, arises from some lesion of the encephalon. In such cases, tonics are not adapted to afford relief; but they are not easy of discrimination, and a plan of treatment, adapted to the general condition of the system, is usually had recourse to. This, as I have said, is generally required to be of a tonic kind.

The vegetable tonics are, in these cases, not equal to the mineral; and, of the latter, the nitrate of silver is to be preferred, perhaps, to any of the others. I have succeeded in removing many cases of epilepsy through its means; but it requires to be

persevered with for a considerable time. Rarely will it be found to exert any decided efficacy before the end of the first month. The preparations of zinc, copper and iron, are likewise employed in such morbid conditions, but they are not usually as efficacious as this salt of silver.

In chorea, the hopes of the practitioner are placed, almost entirely, on the appropriate use of tonics, combined with cathartics to remove the torpid state of the intestinal canal, which prevails in this disease. Here, again, the mineral tonics are preferred, as well as in chlorosis, which commonly occurs in those in whom there is considerable torpor of the system,—characterized by pale and lurid complexion; languor; listlessness; depraved appetite; indigestion; palpitation, &c.

In neuralgia,—employed as a generic name for a number of diseases,—the principal symptom of which is a very acute pain, exacerbating, or intermitting, which follows the course of a nervous branch; extends to its ramifications, and seems, therefore, to be seated in the nerve,—the plan of treatment by chalybeates has been found the most satisfactory. In this distressing disease—one variety of which has been long known under the name *tic douloureux*—the greatest diversity of agents has been made use of:—bleeding, general and local; emetics; purgatives; rubefacients; vesicants; cauterants; anodynes; mercurial frictions; electricity; division of the nerve, and excision of a portion of it, &c., &c.; but one of the most successful remedies is, undoubtedly, the carbonate of iron, given in large doses,—for instance, in doses of thirty or forty grains twice or thrice a day. This course of treatment, continued for a month or two, will often relieve, and ultimately remove this much dreaded affection. The mode in which it acts is by no means clear. It is, of course, through the nerves of the stomach, that any new action must be induced in the nervous system generally, and in the nerves affected with neuralgia, in particular. Since its first introduction into practice for this purpose, by Mr. B. Hutchinson, of Southwell, England, upwards of sixteen years ago, I have had repeated opportunities for exhibiting it, and often with the most happy results. In one case, a lady had suffered under the most excruciating hemicrania, or ‘megrin,’—essentially an intermittent neuralgia of one half the encephalon,—for which depletion, anodynes, counterirritants, &c., had been used in vain. She was confined to bed more than half her time, and suffered intensely: yet the

affection was completely removed by the use of the carbonate of iron, and although it is now eight years since the cure was effected, the symptoms have not recurred. I could allude to many similar cases.

Bitters, and, indeed, the whole class of tonics, are anthelmintics, or unfavorable to the generation of entozoa within the body; but this subject will occupy us in the next section. They are likewise found to be serviceable in many chronic cutaneous diseases, unaccompanied by any thing like febrile excitement, as in some varieties of the strophulus, lichen, prurigo, psoriasis, &c., in which their efficacy is mainly perhaps exerted through the changes they induce in the blood, and, through that fluid, on the vessels of the affected parts.

The surgeon places his main reliance upon the employment of tonics,—where gangrene is about to take place in any part of the frame,—administered internally, as well as applied to the gangrenous part, where this is practicable. For this purpose, the cinchona, or its active principle, is found most effectual. In short, in all cases in which the powers of the system appear to be below the due standard; or, where the action of the nervous system is particularly impaired; where the skin is pale; the pulse feeble; the solids loosely cohering; and where the ordinary indications of cachexia are present, tonics are demanded; and even in cases, where the practitioner, owing to evidences of general febrile or local irritation, is doubtful, whether they may be productive of advantage, he may venture upon their administration, when he would be afraid to use ‘excitants proper.’ Too much dread is, indeed, generally inculcated, and entertained, regarding them. The remarks of Dr. Thomson, on this point, are extremely just, and apposite. “Upon the whole,” he says, “it is necessary, that tonics should not be confounded with stimulants; and although it is proper to prescribe them with caution in any form of fever complicated with local inflammation, yet, we ought not to be prevented by the dread of inflammatory symptoms from employing a class of remedies, so well calculated to restore the strength and vigour of the nervous system, essential for carrying on the functions of life. *We must recollect that tone is not excitement, nor strength increased vascular action.*”*

The abstraction of caloric from the body, by the application of

* Op. citat. i. 747.

cold to the surface,—as by cold bathing,—has long been ranked amongst tonic agencies—with what propriety I have considered elsewhere.* The direct effect of such abstraction is certainly sedative, and, therefore, when the vital energies are too strongly exerted, it may, by reducing these, effect indirectly a tonic agency; but if it be exhibited, when languor, and diminished action pervade the frame, during existing disease, in the state of convalescence, or in feeble infancy, the depressing effects of the application will be rendered manifest. In this respect, the cold and the hot bath are opposed to each other,—the former exerting a sedative, the latter an excitant agency. The judgment is often misled by the feeling of glow over the whole surface, which follows immersion in the cold bath, when a healthy individual has recourse to it; but this feeling is fallacious. The reaction is not really as great as it appears to be, owing to the mind instinctively contrasting the existing sensation with the one immediately preceding it, as it does indeed on all occasions. If we descend into a cellar in winter, and again in summer, we have, in the former season, the impression of warmth, and, in the latter, that of cold, although the temperature of the cellar may be nearly the same at both seasons,—a comparison being instinctively instituted between the temperature felt, in both cases, immediately previous to the descent; and as, in the one case, the air above was colder, and, in the other, hotter than that of the cellar, the feeling, experienced in the room, was, in the former case, that of augmented, and in the latter that of diminished, temperature.

Exercise is likewise a tonic, that may be employed with much advantage in disease. When combined, indeed, with mental amusement—such as travelling exercise affords—its salutary results are sometimes astonishing.

When we regard the effects, which active exercise is capable of inducing, and the degree of effort, which is necessarily required, we can readily appreciate the cases in which it may be found advantageous or the contrary. It is, of course, singularly inappropriate during acute diseases of any kind; and, as one of its chief effects is to augment the energy of the circulation, and to cause the blood to circulate through every portion of the capillary system,—if hyperæmia exists in any part of the frame, it may increase it; whilst if obstructions are present to a trifling extent

* ‘Elements of Hygiene,’ p. 410.

only, the impetus, afforded by the remedy, may tend to remove them.

But even where 'active' exercise is improper, the 'passive' may be adopted; and the change of air and scene, thus afforded, unites with the motion in impressing a salutary influence on a frame debilitated by disease. I have elsewhere entered into the physiology of the different active and passive exercises in a hygienic point of view, and have suggested the different remedial and injurious results, that may be induced by any and by all of them.* I shall, therefore, confine myself, at present, to a few general observations for the guidance of the therapeutical inquirer.

It is in the great class of nervous diseases, that we find exercise—especially travelling exercise—so markedly beneficial; and it is surprising what an amount of exercise a feeble individual, under such circumstances, is capable of enduring, without fatigue. Allusion has already been made to the surprising feats of strength executed by the maniac, and by those, whose encephalic functions are inordinately exalted. The cases of resistance afforded by the valetudinarian, whilst toiling over steep ascents in situations new, but of engrossing interest, to him, must be accounted for in the same manner. This has been forcibly illustrated by a recent writer of distinction.† "In the month of August, 1823," he says, "the heat was excessive at Geneva, and all the way along the defiles of the mountains, till we got to Chamouni, where we were at once among ice and snow, with a fall of forty or more degrees of the thermometer, experienced in the course of a few hours, between midday at Salenche, and evening at the foot of the glaciers in Chamouni. There were upwards of fifty travellers here, many of whom were females and invalids; yet none suffered inconvenience from this rapid atmospheric transition. This was still more remarkable in the journey from Martigny to the great St. Bernard. On our way up, through the deep valleys, we had the thermometer at ninety-two degrees of reflected heat for three hours. I never felt it much hotter in the East Indies. At nine o'clock that night, while wandering about the Hospice of St. Bernard, the thermometer fell to six degrees below the freezing point, and we were half frozen in the cheerless apartments of the monastery. There were upwards of forty travellers there—some of them in very delicate health; and yet

* 'Elements of Hygiène,' p. 425, et seq.

† Johnson, on 'Change of Air, or the Philosophy of Travelling,' N. York Edit. p. 27.

not a single cold was caught, nor any diminution of the usual symptoms of a good appetite for breakfast next morning."

This resistance to deranging influences is more striking than singular. It is fortunate for us, that the condition of the functions, during an elevated temperature, still continues for a time after the temperature becomes depressed. Were it otherwise, the worst consequences would follow an immersion in the cold bath, after the system had been violently excited by the application of heat—as is the practice with the Russians in their vapor baths—as well as the sudden vicissitudes, to which the climate of the United States is liable. The same disadvantage might apply, though to a less extent, to a change of climate. The excited condition of the capillaries of the dermoid tissue, induced by inordinate heat, subsides gradually when the temperature is suddenly reduced, and in such a manner, that a power of resistance remains for a time; hence it is, that we pass with impunity from a hot room, in the depth of winter, to the external air, largely perhaps below the freezing point; and a similar power of endurance continues for some time after a person has quitted a torrid, to reside in a temperate or frigid, region, and conversely.

It is obvious, from what has been said, that the occupation of the mind by a succession of pleasing objects—constituting 'amusement'—must be regarded as a tonic influence, and many a valetudinarian, who quits the town during the summer, suffering under dyspepsia, or hypochondriasis, or worn down by some corroding or protracted malady, finds his uneasy feelings disappear, and himself almost renovated before he reaches the end of his journey towards some of the fashionable watering places. A great deal of this effect is owing to simple change of air—so beneficial to the civic resident in a hygienic respect—much also to the exercise; but the chief part, perhaps, to the mental occupation afforded by varied scenery, and society, on the way. The whole physical circumstances surrounding the individual are changed; and he abandons himself to new impressions, which break in upon the monotony of the old.

Confidence, and hope must likewise be esteemed valuable tonics. I have previously described the influence, exerted by confidence in the physician on the action of his remedial agents,—as well as the great advantage to the patient, in several malignant diseases, that he should not give up hope,—'the sick man's health,'—but that, on the contrary, he should cherish it as one of

the most influential agencies in his recovery. It has been properly said by a distinguished poet—himself a physician—that

“whatever cheerful and serene
Supports the mind, supports the body too,
Hence, the most vital movement mortals feel
Is hope ; the balm and lifeblood of the soul ;
It pleases, and it lasts.”

ARMSTRONG.

Every practitioner must have observed the tonic effect of hope, where it has been enthusiastically indulged ; and, on the other hand, the blighting results of hope deferred, or lost. It is a common saying, that the physician might as well destroy the patient at once, as tell him there is no hope ; and, in certain affections, this is an approximation to the fact. Where the functions are already greatly depressed, such a communication is not likely to detract from the depression. Perhaps in no case was the corroding effect of mental anxiety and doubt more exemplified than in the nostalgia, which was so common during the domination of Napoleon, when the young conscripts were torn from their families and their friends, and forced into foreign and far distant countries ; a disease which has been said so frequently to affect the Swiss, who have left their homes and their country to dwell in some other clime. Rogers has a beautiful allusion to this *Heimweh*, or ‘Homeache,’ as well as to the influence of association, in his ‘Pleasures of Memory :’—

“The intrepid Swiss, who guards a foreign shore,
Condemn’d to climb his mountain cliffs no more,
If chance he hear the song so sweetly wild,
Which on those cliffs his infant hours beguil’d,
Melts at the long lost scenes that round him rise,
And sinks a martyr to repentant sighs.”

To conclude :—the effect of mental tonics on the system—especially those of hope and confidence—are well exhibited in the following extract from Dr. A. T. Thomson’s work, to which I have so often referred.

“Were any thing requisite to prove the power of mental tonics in disease, it would be only necessary to refer to their influence in sustaining the body under fatigue which could not otherwise be borne. What is it but hope and confidence, which enable a mother, night after night, to watch at the bedside of a sick infant ?—to bear up, even with a weak and delicate frame of body, under fatigues which no stranger could sustain, and yet, if the object of her solicitude recover, to suffer no inconvenience

from the exertion:—take away the tonic powers of hope and confidence, or let all her attentions prove unavailing and her infant fall a victim to the malady, then her health will give way, she will feel the exhaustion which naturally follows exertions too powerful for the strength of her body to sustain with impunity, and fall a victim of the anxiety and watching, under which hope and confidence had so long borne her up, and which could alone sustain her by their tonic powers. Nothing can exceed the truth, as well as the beauty of the passage in Milton's description of the Lazar-house, in which the greatest evil is the absence of hope:—

A lazarus-house it seem'd wherein were laid
 Numbers of all diseases, all maladies
 Of ghastly spasm, or racking torture, qualms
 Of heartsick agony, all feverous kinds,
 Convulsions, epilepsies, fierce catarrhs,
 Intestine stone and ulcer, colic pangs,
 Demoniac phrenzy, moping melancholy,
 And moonstruck madness, pining atrophy,
 Marasmus, and wide-wasting pestilence,
 Dropsies, and asthmas, and joint racking rheums.
 Dire was the tossing, deep the groans; despair
 Tended the sick busiest from couch to couch;
 And over them triumphant death his dart
 Shook, but delay'd to strike, though oft invoc'd
 With vows, as their chief good and final hope."

Despair, indeed, in every instance where disease falls upon mortality, may be regarded as bearing the standard in the van of death."*

* Op. citat. i. 740.

TABLE

OF THE CHIEF TONICS, AND THEIR OFFICINAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Acidum Arseniosum. <i>Arsenious Acid.</i> <i>White Arsenic,</i> <i>White Oxide of Ar-</i> <i>senic.</i>	} .....	..... Liquor potassæ Arsenitis, Liquor Arsenicalis. <i>Fowler's Solution.</i> <i>Tasteless Ague Drop.</i> (Pulv. acid arsenios; potassæ car- bon. puriss. ana gr. 64; aq. dis- tillat. O j.; coque donec acidum solutum sit; adde sp. lavand. comp. f. dr. 4; aquæ distill. q. s. ut fiat O j.)	{ gr. 1-10th to 1-4th. } m 5 to 15.
Acidum Nitricum. <i>Nitric Acid.</i>	{ from the nitrate of pot- assa by the action of sulphuric acid.	{ Acidum nitricum dilutum (Acid. nitric. f. oz. 1; Aquæ distil. f. oz. 9.)	{ m 20 to 40.
Acidum Sulphuri- cum. <i>Sulphuric Acid.</i>	{ By burning a mixture of sulphur and nitrate of potassa.	{ Acidum sulphuricum aromaticum. <i>Elixir of Vitriol.</i> (Acid sulphur. f. oz. 3½; Zingib. contus. oz. 1. Cinnam. contus. oz. 1½; Alcohol O ij.) Acidum sulphuricum dilutum. (Acid. sulphur. f. oz. 1; Aq. f. dr. 13.)	{ m 10 to 30. } m 10 to 30.
Argenti Nitras. <i>Nitrate of silver.</i> <i>Lunar Caustic.</i>	{ From the union of } silver and nitric acid.	}	{ gr. ¼ gradually to gr. 4 or 5.
Bismuthi Subnitrates. <i>White oxide of Bis-</i> <i>muth.</i>	}	}	{ gr. 2 gradually to 10 or 15.
Carbo Ligni. <i>Charcoal.</i>	}	}	{ gr. 10 to dr. 1.
Cascarilla <i>Cascarilla.</i> (The bark of the <i>Cro-</i> <i>ton Eleutheria</i> .)	{ From the W. Indies.	{ Infusum Cascarillæ. (Cascarillæ oz. 1; Aq. bullientis O. 1.)	{ gr. 20 to dr. 1. } f. oz. 1½ to f. oz. 2.
Cinchona flava. <i>Calisaya Bark.</i> <i>Yellow Bark.</i>	{ (From the <i>Cinchona</i> <i>cordifolia</i> of S. A- merica.)	}	{
Cinchona pallida. <i>Pale Bark. Crown</i> <i>Bark.</i>	{ (From the <i>Cinchona</i> <i>lanceifolia</i> of S. A- merica.	}	{ gr. 10 to 90.
Cinchona rubra. <i>Red Bark.</i>	{ (From the <i>Cinchona</i> <i>oblongifolia</i> of S. America.	}	{

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
		Decoctum Cinchonæ (Cinchon. cort. contus. oz. 1; Aq. O i. Coque per minut. 10.)	f. oz. 1½ to f. oz. 3.
		Extractum Cinchonæ.	gr. 10 to 40.
		Infusum Cinchonæ (Cort. Cinch. oz. 1; aq. bullientis O i.)	f. oz. 1½ to f. oz. 3.
		Tinctura Cinchonæ. (Cort. Cinch. pulv. oz. 6; Alcohol. dilat. O ij.)	f. dr. 1. to f. oz. ¼.
		Tinctura Cinchonæ composita. <i>Huxham's tincture of Bark.</i> (Cort. Cinchon. in pulv. oz. 2; cort. Aurant. exsiccata. oz. 1½; Rad ser- pentariæ contus. dr. 3; Croci, santal. rubr. ana dr. 1; Alcohol dilat. oz. 20.)	f. dr. 1 to f. oz. ½.
Cinchonina. Cinchonia. Cinchonine.	{ (From the different species of cinchona, but especially from the <i>Cinchona lanci- folia</i> .	{ Cinchoninæ sulphas.	gr. 8 to 20. gr. 10 to 20.
Colomba. Columbo. (The root of the <i>Coc- culus palmatus</i> .)	{ From Mozambique...	{ Infusum Colombæ. (Colombæ oz. ½ Aq. bullient. O 1)	gr. 15 to 60. f. oz. 1½ to f. oz. 3.
Cornus Florida Dogwood,— And also the <i>Cornus circinata</i> or round leaved dogwood; and the <i>Cornus sericea</i> or Swamp dogwood. (The Bark.)	{ From an indigenous } tree.	{ Tinctura Colombæ Colombæ oz. 2½; alcohol. dilat. O 2)	f. dr. 1 to f. dr. 4. gr. 20 to 60.
Cupri Acetas Acetate of copper. Verdigris.	{ On a large scale, by exposing sheets of copper to the refuse after the expression of the grape.	{ Cupri Sulphas.	gr. ¼ to ½.
Cupri Sulphas. Sulphate of copper. Blue Vitriol, Blue Stone.	{ Generally, by dis- solving old scrap copper in sulphu- ric acid.	{ Cuprum ammoniatum.	gr. ¼ gradually to 2.
Cuprum ammoniatum. Ammoniated copper.	{ From Cupri sulph. oz. ½; Ammon. carb. dr. 6. Rub and dry.	{ Cusparia.	gr. ¼ gradually to 5.
Cusparia. Angustura. The bark of the <i>Gali- pea officinalis</i> .)	{ From South Ame- rica.	{ Infusum Cuspariæ vel Angusturæ. (Cort. cusp. oz. ½; aq. bullient. O 1.)	gr. 10 to 30. f. oz. 1½ to f. oz. 3.
Eupatorium perfolia- tum. Thoroughwort. (An indigenous herb.)	{ As a precipitate, by mixing solutions of the sulphate of iron and the carbonate of soda.	{ Tinctura Cuspariæ vel Angusturæ. (Cort. Cuspar. oz. 2. Alcohol. dilat. O ij.)	f. dr. 1 to f. oz. ½. gr. 20 or 30.
Ferri carbonas præci- pitatus. Precipitated carbon- ate of iron.	{ As a precipitate, by mixing solutions of the sulphate of iron and the carbonate of soda.	{ Infusum Eupatorii perfoliati. (Eupator. perfol. oz. 1. aq. bull. O 1.)	f. oz. 1½ to f. oz. 3. gr. 5 to 60.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Ferri carbonas præparatus, <i>Prepared carbonate of iron.</i> <i>Rust of iron.</i>	{ By moistening iron wire frequently, and exposing it to the air; then levigating the rust formed. }	{ }	gr. 5 to 60.
Ferri emplastrum. <i>Ironplaster. Strengthening plaster.</i>	{ From Ferri oxid. rubr. oz. 8, emp. plumb. lb. 2, resin. oz. 6, ceræ flavæ; Ol. Oliv. ana oz. 3. }	{ }	
Ferri ferrocyanas. Ferri Cyanuretum, <i>Ferrocyanate of iron.</i> <i>Prussiate of iron,</i> <i>Prussian blue.</i>	{ On the small scale, by the double decomposition between Ferrocyanate of potassa, and an acid solution of persulphate or permuriate of iron. }	{ }	gr. v.
Ferri et potassæ tartras. Ferri tartarizatum. <i>Tartrate of iron and potassa.</i>	{ By boiling the precipitated carbonate of iron, the super-tartrate of potassa and water together; filtering and evaporating. }	{ }	gr. 10 to 60.
Ferri murias. <i>Muriate of iron,</i>	{ By dissolving iron in muriatic acid. }	{ Tinctura Ferri muriatis (Ferri carbon. præcip. lb. $\frac{1}{2}$, acid. muriat. O 1; alcohol O 3. Dissolve the iron and add the alcohol) }	{ m 10 to 30. }
Ferri phosphas, <i>Phosphate of iron.</i>	{ As a precipitate by adding a solution of the sulphate of iron to one of the phosphate of soda. }	{ }	gr. 5 to 40.
Ferri sulphas. <i>Sulphate of iron.</i> <i>Green Vitriol. Green copperas.</i>	{ From Ferri Filor.; acid. sulph. ana oz. 8; aq. O 4. Evaporate and crystallize. }	{ }	gr. 1 to 5.
		{ Mistura Ferri composita. <i>Compound mixture of iron.</i> <i>Griffiths's mixture.</i> (Myrrh in pulv. dr. 1; potassæ carb. gr. 25; aq. rosar. O $\frac{1}{2}$. Ferri sulph. scr. 1; sp. lavand. f. oz. $\frac{1}{2}$. sacchar. purif. dr. 1.) }	{ f. oz. $1\frac{1}{2}$ to f. oz. 3. }
		{ Pilulæ Ferri compositæ. <i>Compound pills of iron.</i> (Myrrh in pulv. dr. 2. sodæ carbonat. Ferri sulph. ana dr. 1; syrurup q. s. f. massa.) }	{ gr. x. to 30. }
Ferrum ammoniatum. <i>Ammoniated iron.</i>	{ By subliming a mixture of Red oxide of iron, and muriate of ammonia. }	{ }	gr. 15. to 60.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Gentiana. <i>Gentian.</i> (The root of the <i>Gentiana lutea</i> .)	{ From the Apennines, Alps, Pyrenees, &c.	{ }	{ gr. 10 to 60.
		Extractum Gentianæ. <i>Extract of gentian.</i> (Made like the ordinary aqueous extracts.)	{ gr. 10 to 30.
		Infusum Gentianæ compositum. <i>Compound infusion of Gentian.</i> (Gentian contus. oz. $\frac{1}{2}$; cort. aurant. coriandr. ana dr. 1; alcohol. dilut. f. oz. 4.; aq. (frigid) oz. 12.)	{ f. oz. 1.
		The London College has a simple infusion,—made of Gentian, cort. aurant. ana dr. 1; cort. limon. recent. dr. 2.; aq. bullient. f. oz. 12.	{ f. oz. $1\frac{1}{2}$ to f. oz. 3.
		Tinct. gentianæ, <i>Tincture of gentian.</i> (Gentian. contus. oz. 2, cort. aurant. oz. 1. sem. cardam. contus. oz. $\frac{1}{2}$. alcohol. dilut. O 2.)	{ f. dr. 1 to f. oz. $\frac{1}{4}$.
		Vinum gentianæ compositum. <i>Wine Bitters.</i> (Gentian contus. oz. $\frac{1}{2}$. pulv. cinchon. oz. 1. cort. aurant. dr. 2; cannellæ dr. 1; alcohol dilut. f. oz. 4; vini. O ij.)	{ f. oz. $\frac{1}{4}$ to f. oz. 1.
Gentianina, Gentia. <i>Gentianine.</i> (The active principle of the <i>Gentiana lutea</i>.)	{	.....	gr. 2 to 4.
Liriodendron, <i>Tulip tree bark.</i> <i>Poplar bark.</i> (From the <i>Liriodendron tulipifera</i> , of the United States.)	{	.....	dr. $\frac{1}{4}$ to dr. 1.
Lupulina, <i>Lupuline.</i> (The powder, attached to the strobiles of the <i>Humulus lupulus</i>.)	{	.....	gr. 6 to 12.
		Tinctura Lupulinæ. (Lupulinæ oz. 4; alcohol O ij.)	{ f. dr. 1 to f. dr. 3.
Piperina, <i>Piperine.</i> (A peculiar crystalline matter obtained from the <i>Piper nigrum</i>.)	{	.....	gr. 1 to 10.
Prunus Virginiana, <i>Wild cherry bark.</i> (From the <i>Prunus Virginiana</i> , of the United States.)	{	.....	gr. 30 to 60.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Quassia, <i>Quassia</i> .	{ From the West Indies.	{ }	gr. 30 to 40.
(The wood of the <i>Quassia excelsa</i> .)		Infusum Quassiæ. <i>Infusion of Quassia</i> . (Quassiæ rasur. dr. 2. aq. frigid. O l.)	{ f. oz. 1 to f. oz. 3.
Quinina, Quinia, Quina. <i>Quinine</i> .	{	Tinctura Quassiæ. <i>Tincture of Quassia</i> . (Quassiæ ras. oz. 1; alcohol dil. O ij.)	{ f. dr. 1 to f. oz. ½.
(The active principle of the <i>Cinchona cor- difolia</i> ; contained, al- so, in smaller quanti- ty, in the other cin- chonas.)		.....	gr. 1. to 12.
		Quininæ sulphas, <i>Sulphate of Quinia</i> .	{ gr. 1 to 12.
		Pilulæ Quininæ sulphatis, <i>Pills of the sulphate of Quinia</i> . (Quininæ. sulph. oz. 1. G. Arab. in pulv. dr. 2; Syrup q. s.:—divide in- to 480 pills.)	{ Each pill con- tains a grain of the sulphate.
Salix, <i>The Willow</i> .	{	Quininæ Syrupus, <i>Syrup of Quinine</i> . Syrup simpl. O ij; Quininæ sul- phat. dr. 1.)	{ f. oz. ½ to f. oz. 1.
The bark.		.....	gr. 10 to 90.
Salicina, <i>Salicine</i>.		.....	gr. 1 to 12.
(The active principle of the Salix.)			
Serpentaria, <i>Virginia Snake root</i> .	{ From the <i>Aristo- lochia serpentaria</i> , of the Unit. States.	{ }	gr. 15 to 60.
		Infusum Serpentariæ. (Serpentariæ oz. ½. aq. bull. lb. 1.)	{ f. dr. 1 to f. oz. ½.
		Tinctura Serpentariæ. (Serpentar. contus. oz. 3; alcohol. dilut. O ij.)	{ f. dr. 1. to f. oz. ½.
Zinci oxidum, <i>Oxide of zinc</i> . <i>Flowers of zinc</i> .	{ By precipitation from Zinci sulph. lb. 1. aq. ammon. q. s.; Aquæ O 4.: also by combustion.	{ }	gr. 2 to 8.
Zinci Sulphas. <i>Sulphate of zinc</i> . <i>White vitriol</i> .	{ By dissolving zinc in dilute sulphuric acid, and crystal- lizing.	{ }	gr. 1 to 2.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
<p>Aquæ minerales. (acidulæ et ferrugi- nosæ.) Mineral waters. (Carbonated or acidu- lous, and chalyb- eate.</p>	<p>The carbonated waters of the sweet springs in Monroe co. Virginia; of Bath in Berkley co.; of Mont d'Or and Vichi in France, and of Seltz in Germa- ny; and the chalyb- eate waters, of Spa, Toeplitz, Pyrmont, and Tunbridge in Europe; and of Ballston, Saratoga and Albany in N. York; Hopkinton in Massachusetts; and Bedford, Pitts- burg and Frank- fort in Pennsylv- ania.</p>		
<p>Mental tonics. (Confidence, Hope, Amusement, &c. Travelling exercise.</p>			

SECTION III.

ANTHELMINTICS.*

Definition of Anthelmintics—Different kinds of human entozoa—Mode of generation—Causes of their development—Symptoms of worms—Symptoms of particular varieties—Experiments on worms, out of the body—Different kinds of Anthelmintics—Ectozoa.

THIS class of medicinal agents—in the sense of medicines, which prevent the generation of entozoa within the body—may be made to follow, with much propriety, the class of tonics, inasmuch as the great predisponent cause of invagination is a condition of the system, which tonics are well adapted to remove. I do not, however, intend to restrict the acceptance of the term ‘anthelmintics’ to the definition given above; but to extend it by adding,—‘and which destroy or expel such entozoa, when already existing there.’

It is somewhat singular,—as before observed,—that the class should form a *casus omissus* in Dr. Thomson’s recent work on the *Materia Medica and Therapeutics*. It is neither comprised in his table of classification, nor in the body of the treatise, although the term ‘anthelmintic’ is repeatedly used, when treating of substances presumed to possess such virtues. The omission is, therefore, manifestly inadvertent.

The common definition of anthelmintics is—“remedies which destroy or expel worms situated in any part of the alimentary canal.” Murray and Paris restrict it to ‘remedies, which expel worms;’—but this is an unimportant part of their operation. The great object is to get rid of the predisposition to their generation. The anthelmintics, that destroy or expel, merely remove the parasites already present in the alimentary tube; but, unless

* *Anthelmintica*, *Antiscolica*, *Antiverminosa*, *Vermifuges*, from *avti*, ‘against,’ and *ελμινς*, ‘a worm.’

the asthenic condition, which gives occasion to their reproduction is removed, the evil will constantly recur.

Before referring more particularly to the *modus operandi* of this class of therapeutical agents, it will be well to consider briefly the nature, mode of generation and symptoms of intestinal entozoa; on many points of which considerable dissidence exists amongst physiological naturalists.

In this country, but little attention has been paid to Helminthology. We, consequently, generally adopt the classification of some or other of the continental naturalists of Europe, whose investigations in natural science have taken this direction. On the continent of Europe, invagination—as it is called—is looked upon as the source of more maladies than with us, more than it is probably concerned in inducing; and hence, in part, the number of those who have cultivated the natural history of entozoa.

In the synopsis of Rudolphi,* the different entozoa, that infest the animal body, are divided into six orders:—*Nematoidea*, *Acanthocephala*, *Trematoda*, *Cestoidea*, *Cystica*, and *Entozoa dubia*.

The only species of the order *Nematoidea*,† hitherto observed in man, are the *Filaria medinensis*, or Guinea worm,—*Filaria hominis bronchialis*,—the *Tricocephalus dispar*, the *Spiroptera hominis* (found in the urinary bladder,) the *Strongylus gigas*, the *Ascaris lumbricoides*, and the *Ascaris vermicularis*; and of these, the *Tricocephalus dispar*, the *Ascaris lumbricoides*, and the *Ascaris vermicularis* have been chiefly met with in the human intestines;—the *Strongylus gigas*, rarely. It is to these intestinal entozoa, that our attention will be directed, as the others rarely fall under the management of the Therapeutist, and do not require the application of the great general principles, involved in the consideration of intestinal invagination: their presence in the body is, besides, adventitious, and where not manifestly produced by the intrusion of an extraneous insect,—the effects of which are perceptible by the senses,—they are usually not suspected, until they appear perhaps in some of the excreta.

* Entozoorum synopsis, Auct. C. Asmund Rudolphi. Berolin, 1829.

† *Nematoidea*, (from *νημα*, 'thread,' and *ειδος*, 'form.') *Corpus teres elasticum. Tractus intestinalis hinc ore, illinc ano terminatus. Alia individua mascula, alia feminea.—Synopsis, etc. p. 3.*

‡ W. Lawrence, in 'Med. Chirurg. Transact.' vol. ii.

The *tricocephalus dispar* or 'long thread worm'* is from an inch and a half to two inches long; the head



Tricocephalus dispar, of the natural size.

a, male; *b*, female;
c, tail of the male, greatly magnified.

is acute, the body spirally involuted in the male, almost straight in the female; the sheath of the penis is pyriform; the capillary portion forms about two thirds of its whole length, and contains a white, pellucid, reddish, or brown matter:—the general characters of the genus *tricocephalus* being,—a cylindrical and elastic body; the anterior capillary portion terminating abruptly in a larger. The mouth orbicular, and the genital organ of the male simple and vaginated.

This worm generally inhabits the large intestines; especially the cæcum. It is rarely seen in the small intestines. Rudolphi found more than a thousand in the intestines of one female.

The genus *Ascaris*† is thus defined by Rudolphi “corpus teres elasticum utrinque attenuatum. Caput trivalve, genitale masculinum: spiculum duplex.”† The two species of the genus, that infest the human intestines, have been separated by Bremser—a distinguished German Helminthologist—the *ascarides vermiculares* having been placed in the genus *oxyuris*; but the separation is not admitted by Rudolphi and many other naturalists, and has not been adopted by medical inquirers.

* *Synonyma*.—*Trichuris*, *Trichuris vulgaris*, *T. intestinalis*, *Ascaris Trichiuria*, *Tricocephalus hominis*, *Mastigodes hominis*; from *τριχος*, ‘hair,’ and *κεφαλη*, ‘head.’

† Rudolph. *Op. citat.* p. 16. ‡ From *ασκαριζω*, ‘I jump.’

The *ascaris lumbricoïdes*,* or long round worm, has the head naked; the body sulcated on each side, and the tail somewhat obtuse. It is most commonly met with in the intestinal canal, especially in the small intestines; traversing, at times, the whole length of the canal; penetrating into the ductus pancreaticus, the ductus communis choledochus, and gallbladder; ascending into the stomach, and œsophagus, and, occasionally, voided even by the mouth. It descends also into the great intestines, passes the ileocæcal valve, and makes its exit at the anus. Occasionally, the whole of the intestinal tube—from the duodenum to the anus—is filled with them; and they are at times voided in the form of a ball. Frank saw eighty passed in this manner during an acute fever. When dead, this worm is quite stiff.

The *ascaris lumbricoïdes* is usually from six to twelve inches in length, and from a line and a half to two lines in diameter at the middle. The largest, met with by Rudolphi, was fifteen inches long, and the smallest an inch and a half. Their colour varies according to the matter they may have imbibed by the nutritive organs. Frequently, it is of a milky or brownish ash, rarely of a blood red color.†

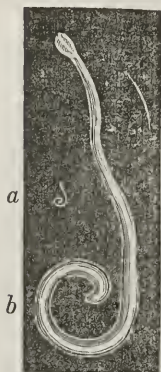


Ascaris lumbricoides.
a, the male, about one third the usual size; b the female.

* *Synonyma*.—*Lumbricus teres hominis*, *Lumbricus intestinalis*, *Ascaris gigas hominis*, *Fusaria lumbricoides hominis*, from *Lumbricus*, an 'earth worm,' and *ειδος*, 'resemblance.'

† See 'Anatomie des vers intestinaux—*Ascaride lombricoide* et *Echinorrhynque* geant.' etc. Par Jules Cloquet, pp. 1 to 61. Paris, 1824.

The *ascaris vermicularis*,* *maw or thread worm*, has an obtuse head, with a lateral vesicular membrane on both sides; the body larger at its anterior part; the tail of the male, spiral and obtuse; ^c that of the female subulate and straight. It is generally from two to five lines long; small; white, and very elastic.



Ascaris vermicularis.

a, male, of the natural size; *b*, the same, much magnified; *c*, the female.

This parasite is commonly found in the rectum; but it is migratory. Usually, it is met with in children; but not unfrequently in adults.

The ascarides are most frequently found gregariously—*en troupe*—in the intestinal canal, in the form of a ball, and frequently so covered by mucus as not to be easily accessible to the true anthelmintics. At times, they migrate from the intestines, and lodge in the external parts of generation, or in the urethra, irritating the parts, and occasioning a discharge from the mucous follicles,—or a kind of leucorrhœa.

A number of these worms, it is asserted, has been found in the intestines of a new born child; and cases have occurred, in which large quantities of them have been thrown off the stomach by vomiting. Cysts, filled with ascarides, have likewise been discovered between the membranes of the stomach and œsophagus.† It is proper, however, to observe, that great errors have been committed regarding this worm. Redi and Joerdens, according to Rudolphi,‡ have both described, as a sort of ascarides, the larve of the fly; and it is asserted, that other eminent writers on Helminthology have committed similar errors; some of which are scarcely comprehensible;—the mistake, for example, fallen into by Coulet, who confounded the separate joints of the *tænia solium* with the ascarides; or the error of those, who mistook the torn portions of the *tricocephalus* or of the *ascarides lumbricoides* for them.

These are the chief species, under the order *Nematoidea*, which infest the human intestines.

* *Synonyma* :—*Oxyuris vermicularis*, *Fusaria vermicularis*, *Ascaris pollicaris*, *A. cauda sebacea*, *A. græcorum*, and *Vermis Ascaris*.

† J. P. Frank 'De curandis hominum morbis epitome.' Lib. vi. 347.

‡ *Entozoorium sive vermium intestinalium* Hist. Nat.' ii. 154.

The *strongylus gigas** is rarely found in the intestines. It has an obtuse head; mouth surrounded with six flattish papillæ: the bursa of the male truncated: the tail of the female rounded.



Strongylus gigas.

One half the usual size.

This worm is sometimes met with, five inches, a foot, a foot and a half, and even three feet long; and from two lines to half an inch in diameter. It is erratic. Those, that are found alive, especially in the kidneys, are of a blood red color; but, when preserved in spirit, they become brown, grayish, or white.

The *strongylus gigas* is commonly met with in the kidneys of man, and of several of the mammalia; rarely in other viscera, and still more rarely in the intestinal tube. By Chabert and others, it appears to have been confounded with the *ascaris lumbricoïdes*; but the genera are distinct, and although the latter is seldom, if ever, discharged from the bladder, such an effect might be induced by a morbid process,—as in two cases, related by Frank, where union had taken place between the colon and the bladder, ulceration followed, and the flatus and excrements were discharged with the urine.

None of the order *acanthocephala*† of Rudolphi, which comprises only one genus—the *echinorrhynchus*—have been discovered in the human body.

To the order Trematoda‡ belong entozoa, which have a soft, flattened, or roundish body; suctorial pores; all the individuals androgynous. Of this order three species have been found in the human body;—the *distoma hepaticum*, the *polystoma pingvicola*, found by Treutler in the human ovary; and the *polystoma venarum*.

The distomata in general have a flattened or roundish and soft body; the pores solitary—an anterior and a ventral.

* Genus *strongylus*. Corpus teres elasticum utrinque attenuatum. Os orbiculare vel angulatum. Apex caudæ masculæ terminatus bursa penem emittente. Rudolph. Op. citat. p. 30.

† From *ακανθα*, 'spine,' and *κεφαλη*, 'head.'

‡ Trematoda, (from *τρημα*, 'a foramen'). Corpus depressum vel teretiusculum, molle. Pori suctorii. Omnia individua androgyna.—Rudolph. Synopsis. p. 82.

The *Distoma hepaticum*,* the 'flake,' or 'liver fluke' is obovate, flat, with subconical, very short neck; orbicular pores,—the ventral the larger.



Distoma hepaticum.

a, The young worm.

b, The same magnified.

The young worms are from one to four lines long, and from one third to two thirds of a line broad, and of a variegated brownish white color. The adult are an inch, more or less, in length, and from four to six lines in breadth; of a dirty yellowish, greenish, or brownish color.

The *distoma hepaticum* has been found in the gallbladder of man, although not often. Hence, it passes occasionally into the intestinal tube. It is one of the most common varieties of worms that infest the livers of animals,—as the sheep, goat, ox, stag, fallowdeer, horse, ass, hog and hare. In sheep, affected with the rot, the liver is sometimes filled with them.

It has been stated by some, that the *distoma* has been met with in the branches of the vena porta as well as in the pori bilarii; but Rudolphi contradicts this; and asserts, that when the liver is carefully dissected, it will be found only in the biliary ducts, whence it makes its way into the gallbladder; and, by the ductus communis choledochus, passes into the intestines, in all portions of which he has met with it; but Frank affirms, that in 1758, a young child was dissected at the hospital of Padua, who had died of small-pox, when her liver was found to contain a considerable number of worms—some living, and others dead. These were lodged in the ramifications of the vena porta and hepatic veins. They were of a red color; slightly elongated and soft, and therefore differing somewhat from the *distoma hepaticum*. The true *distoma*, however, notwithstanding Rudolphi's assertion to the contrary, appears to have been discovered alive in the branches of the vena porta.†

To the order *cestoidea*‡ belong the largest of the entozoa met

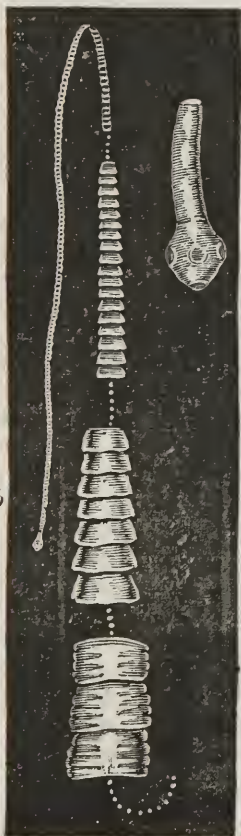
* *Synonyma*. *Fasciola hepatica*, *Planaria latiuscula*, *Fasciola humana*, and *Fasciola lanceolata*; from *δύς*, 'double,' and *στρομα*, 'mouth.'

† *Op. cit.* p. 194.

‡ *Cestoidea*, (from *κεστρος*, 'a belt or tape,' and *ειδος*, 'shape.') *Corpus elongatum depressum molle continuum vel articulatum*. *Caput paucissimorum simpliciter labiatum, reliquorum bothriis vel osculis suctoriis duobus aut quatuor instructum*. *Omnia individua androgyna*.—Rudolph. 'Synops.' p. 127.

with in the human body. They are characterized by an elongated, depressed or flattened, soft, continuous, or articulated body. The head of a small number of the species simply labiated, of the others furnished with two or four suckorial fossulæ or oscula. All the individuals androgynous.

The only species of this order, that inhabit the human body, are,—the *Bothriocephalus latus*, and the *Tænia solium*, both constituting varieties of tape worm, but placed in different genera by Rudolphi;—the former under the genus *Bothriocephalus*;* the latter under that of *Tænia*.†



Bothriocephalus latus.

a. The head, and portions from different parts of the body.

b. The head, greatly magnified.

The *bothriocephalus latus*,‡ or 'broad tape worm' has the head and marginal depressions oblong; scarcely any neck; the anterior articulations in the form of rugæ; the others generally short, almost square, and broader; the last longer. It is flat, or nearly flat; is generally from ten to twenty feet long, and is, at its broadest part, from a few lines to half an inch broad. It is rarely discharged entire; is of a white color, but, when macerated in spirit of wine, it becomes darker; whence it was called by Pallas *tænia grisea*.

Goeze possessed a broken specimen of this parasite, which was sixty yards in length.

This worm is not common in the United States, or in Great Britain. It is much more common in Switzerland and in Russia, where Rudolphi describes it to be indigenous. In France its presence is occasionally recognized every where. In Germany and Holland

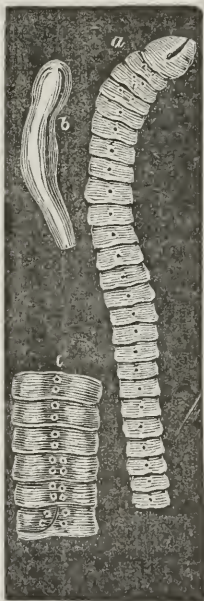
* Genus *Bothriocephalus*. Corpus elongatum, depressum, articulatum. Caput subtetragonum, bothriis duobus vel quatuor oppositis.—Rudolph. p. 136.

† Genus *Tænia*. Corpus elongatum, depressum, articulatum. Oscula capitis quatuor suckoria.—Rudolph. p. 144.

‡ *Synonyma*. *Tænia lata*, *T. vulgaris*, *Lumbricus latus*, *Ver solitaire*, *T. osculis lateralibus geminis*, *T. a anæaux courts*, *T. grisea*, *T. membranacea*, *T. tenella*, *T. dentata*, *T. humana inermis*, *Halysis membranacea*, *T. prima*, *T. osculis lateralibus solitariis*, *T. acephala*, *T. capitata*, *T. osculis superficialibus*. From *βοθριον*, 'a depression,' and *κεφαλη*, 'head.'

it is as uncommon as in Great Britain, and is said to be met with chiefly in foreigners.* The infrequency of its occurrence, in countries where pathological anatomy is so largely cultivated, may be appreciated by the fact, mentioned by Rudolphi, that, so far as he knows, it has never been met with on dissection:—(in cadavere, quod sciam, nunquam repertus est.)

The *tænia solium*, or 'long tape worm,' has an almost hemispherical, discrete head; obtuse beak; the neck full anteriorly; the anterior joints very short; the next almost square; and the rest oblong; the marginal foramina vaguely alternating. It is commonly a few feet long; but, occasionally, it is found of an enormous length. This worm has been met with in the intestines after death. Robin found one adhering to the mucous coat, which extended from the pylorus to the distance of seven inches from the anus; and Frank saw one—which is deposited in the museum at Pavia—forty-seven cubits long. They are said to have been met with even of the enormous length of six hundred feet! Van Doeveren asserts, that a peasant, after having taken an emetic, vomited up forty Dutch ells of tape worm, and "would have got clear of more, if he had not been afraid of puking out all his guts, and for that reason bit the worm off.†



Tænia solium.

- a. A portion of the body and tail.
- b. Head.
- c. Joints with single and double oscula.

This worm is endowed with an undulatory motion; by virtue of which it changes its situation; curls up; swells out; enlarges or contracts its diameter, and becomes shorter or longer. The annuli, separated from each other, preserve, for some hours, their motive faculty. Occasionally, it rolls itself up; and, under such circumstances, gives the sensation of a weight in the intestines, falling from one side to the other, like an extraneous

* Rudolph. 'Synops.' p. 136.

† Synonyma. *Tænia osculis marginalibus solitariis*, *T. cucurbitina*, *T. humana armata*, *Halysis solium*, *Vermis cucurbitinus*, *Lumbricus latus*, *T. sans epine*, *Ver cucurbitaire*, *T. articulos demittens*, *T. secunda*, *T. a longues articulations*, *T. a anneaux longs*, *Ver solitaire*.

‡ Rosen von Rosenstein, 'on the diseases of children.' Sparrmann's translation. p. 231.

body, when the patient turns quickly in bed. When cramped by the position of the patient, or by pressure exerted on the abdomen; disturbed by food, which is disagreeable to it; by medicine, or its own disorders; or when tormented by the approach of death; it leaves hold of the mucous coat, and is said to leap about, and fall, as it were, into convulsions.* It may exist in the intestines along with other worms, although this has been denied. Rosen† knew a poor man's child, four years old, in a very emaciated and debilitated condition, which, immediately after taking a small dram of barley brandy as a cordial, discharged an immense quantity of the *ascarides vermiculares*; eight feet of a slender tape-worm, and ten of the *ascarides lumbricoides*.

The *tænia solium* principally inhabits the small intestine.

Of the two last orders of Rudolphi—*cystica*, and *entozoa vel generis dubii, vel fictitia*, two or three varieties are said to have been met with in man:—The *cysticercus cellulosa*, in the brain and heart,—the *cysticercus visceralis hominis*; the *echinococcus hominis*, in the viscera—especially in the liver; the *diceras rude*, or *ditrachyceras rudis* of Suelzer, scarcely admitted among the genuine entozoa, &c., &c. These do not require description, as their presence is not indicated by any special symptoms. The therapeutical consideration of anthelmintics is necessarily limited to those occupying the intestinal canal, and giving rise to symptoms, which lead to a suspicion of their presence.

The mode of generation of entozoa has been a topic of dispute amongst the older and more modern naturalists. The ancients supposed, that all organized bodies are produced in one of two ways. Amongst the upper classes of animals and vegetables, they believed the work of reproduction to be effected by a process, which they termed 'univocal' or 'regular' generation; but in the very lowest classes,—as the mushroom, the worm, the frog, &c.,—they conceived, that the putrefaction of different bodies, aided by the influence of the sun, might generate life; this mode of generation they termed 'equivocal' or 'spontaneous,' and in no other way could they account for the swarms of frogs and flies, which appeared on the banks of the Nile after its periodical inundations.

The subject of entozoa has been eagerly embraced by the supporters of the doctrine of equivocal generation, who are, of course, of opinion, that the germs of the animalcules need not be received from without. I have elsewhere shewn, that in support

* Frank. Op. cit. p. 201.

† Op. cit. p. 236.

of the latter opinion, it has been attempted to prove, that the worms found in the human intestines are precisely like others, which have been met with out of the body; but the evidence in favor of this opinion is by no means satisfactory.* The fact, too, that entozoa have been found in the intestines of the fœtus in utero, is not easily explicable under that doctrine, unless, indeed, we conclude with Cuvier, that these parasites “propagate by germs so minute as to be capable of transmission through the narrowest passages, so that the germs may exist in the infant at birth.” The difficulties, however, that environ this subject, have induced many distinguished naturalists to conceive it probable, that spontaneous or equivocal generation may occur in the lowest divisions of the living scale.

Leaving the question of their mode of generation, which has been entered into at some length in the works just cited, let us enquire into the causes, that give rise to their development; for, the supporters of both views admit, that there must be circumstances present in the body, in all cases, to favor their development, when they exist to any extent. For example, the supporters of the equivocal doctrine presume, that there must be a certain condition of the system in general, and of the alimentary tube in particular, to produce them; whilst they of the univocal or regular theory equally suppose, that there must be a favorable condition of the system, and a state of the tube, that affords a nidus favorable to the development of the germs, which, in their view, must always be received from without.

One of the most manifest of the remote or predisponent causes of worms is—climate or locality. In Egypt, according to Hasselquist, the *tænia solium* is so common, that a fourth part of the inhabitants of Grand Cairo are infested with it. Rosen asserts, that every other person in Holland, and every tenth person in Switzerland, are affected with *tænia*; and it was formerly contended, that the Hollanders, and other nations subject to this variety of entozoa, had become so from living on a fish diet, in which various species of *tænia* are met with; but this is denied by Müller, who argues properly, that if such were the case, the natives of Denmark and Pomerania, who live much on fish, should be subject to them also, which is not the case.

The *tænia solium* appears to prevail more than the *bothriocephalus latus*;—both the older and more recent writers describing it as the most common species in Egypt, Greece, Italy, Ger-

* ‘Commentaries on Diseases of the Stomach and Bowels of children,’ Lond. 1824, p. 24, and ‘Human Physiology,’ First Edit. ii. 254, and Second Edit. ii. 282.

many, Holland, England, and Sweden : but in Switzerland, and Russia, it is affirmed, that the *bothriocephalus latus* is more common. According to Linnæus, the latter species is the most common in Sweden, but all the specimens, which Rudolphi received from that country, were of the *tænia solium* ; nor did the physicians, there, appear to have met with any other genus so commonly.

Climate, then, is an obvious predisponent to those genera of worms at least. In this country, entozoa prevail largely under circumstances to be mentioned presently, but *tæniæ* are scarcely ever seen,—the *ascarides lumbricoïdes*, and the *A. vermiculares* being almost the only parasitic occupants of the intestinal canal met with.

Age is likewise a predisponent ; childhood being the time of life most prone to invagination. During the first three or four years, the *ascarides vermiculares* are especially frequent, and they are found occasionally in considerable quantity for some years afterwards. The *ascarides lumbricoïdes*, too, generally appear in those of an early age ; but both the one and the other often recur at a more advanced time of life, and are sometimes met with on the dissection of old people. J. Cloquet, however, asserts, that in the large hospital—*La Salpêtrière*—of Paris, where they receive the aged only, he has scarcely ever met with the *A. lumbricoïdes* on dissection ; whilst, in the *Hôpital des Enfants*, which, as its name imports, is appropriated to the reception of children, he has seen multitudes,—as many as forty-two in the same individual.*

The *bothriocephalus latus* and the *tænia solium* are rare in childhood, but more common during youth, and in after periods. The *tricocephalus dispar*, and *filaria medinensis* do not appear to be peculiar to any age ; and nothing precise in this respect is known of the other worms that infest the human body.

The greater part of authors have considered sex as another predisponent ; and they have asserted that worms are more common in the female. Such is the opinion of Pallas, Werner, Frank and others. Rudolphi, too, affirms, that of three cases of *tænia*, which occurred to him in town, and of numerous others in different parts of the country, all the subjects were females ; but, with respect to other worms, his own experience does not enable him to pronounce, that females are more subject to them.

When, however, we consider the grand predisponent cause of worms, which we shall now mention—we can comprehend, that females may be more frequently affected with those parasites than

* Op. citat. p. 4.

males. The sedentary occupations ; privation of light, air and exercise to which too many subject themselves, with irregular and imperfect diet, induce an anæmic or cachectic condition, which is well adapted for the development of entozoa,—either under the theory of univocal, or equivocal generation ;—affording, according to the former, a suitable nidus for the ova received from without ; and, according to the latter, producing the morbid condition necessary for their formation.

The view of Frank, regarding the grand source of predisposition, is the only one, it appears to me, which can be legitimately embraced.* “As parasitic plants,” he remarks, “grow abundantly in a soil left to itself, and uncultivated, whilst they appear only here and there in a fertile field, vivified by the solar rays, and the dews of heaven ; fertilized by a wholesome manure, and by the sweat of the active husbandman ; so do these parasites readily multiply in cacochymic habits, whilst they rarely attack healthy and robust individuals. It is in this that the predisposition consists.” In fact, any debility of the general system or of the digestive organs,—hereditary or acquired ; a scrophulous habit ; a sedentary and idle life ; a poor diet ; residence in a cold, confined, and damp situation ; and, in short, any thing, that can be the cause of an asthenic condition of the alimentary canal and surrounding viscera, may be regarded as intimately associated with the undue prevalence of entozoa in the alimentary tube.

Such being the fact, as proved by daily observation, how strange, erroneous, and dangerous must the sentiments of the enthusiastic Darwin, on this subject, be regarded. Having observed, that in hectic and putrid fevers, lumbrici—the ascarides lumbricoïdes—were occasionally voided, he advised for their destruction, a diet of rotten eggs, putrid meat, &c., for the purpose of producing the fetid stools and the corresponding state of the system, which exist in those diseases. Nothing, of course, could be more favourable for the continued propagation of those animalcules, which it was the object to destroy, than the practice founded upon such faulty theoretical deductions.

Broussais, who is a believer in the equivocal origin of entozoa, explains their occurrence by his touchstone—gastro-enteritis. “Worms in the bowels,” he says, “are most frequently, but not always, the product of the alteration of the mucus and heat, which results from a gastro-enteritis of greater or less intensity ; hence the very various effects of irritating anthelmintics.”

* Op. citat. p. 26.

Prop. cclxxi: and in another Proposition (cclxxxiv,) he affirms:—"The worms, which accompany acute gastro-enteritis being the effect of this phlegmasia, do not require any particular remedies; they are expelled by nature, after the subsidence of the inflammation:" and again—Proposition cclxxxv:—"Worms do not demand a particular treatment for their expulsion, except when unattended by acute or chronic gastro-enteritis, or after this inflammation has been sufficiently checked."

As he affords us no evidence in support of the views contained in these propositions, they can only be received in the light of assertions, which the author believes, but which—as mere *verba magistri*—cannot be admitted amongst the facts of the science. So far as my experience, indeed, goes, there is no evidence, that any gastro-enteritis is capable of *directly* causing worms, and least of all an acute gastro-enteritis; nor can I see, that the trifling augmentation of heat in such a disorder could favour their development more than the ordinary temperature of the human stomach. In those cases, too, which constitute acute gastro-enteritis, there is not time enough, it is to be presumed, for the full development of such *ascarides lumbricoides* as we occasionally see passed. Besides, in cases of continued fever, in which we sometimes witness their discharge, the worms are voided long before the followers of the Broussaian doctrine of fever would admit that the gastro-enteritis had yielded. The discharge of entozoa, in such cases, it appears to me, is neither an evidence, that they were caused by the supposed gastro-enteritis; nor that they were the cause of the fever, as would be maintained by many after their extrusion. The worms were probably existing in the alimentary tube before the commencement of the fever; and their situation becoming unpleasant to them, in consequence of the increased heat, and the vitiated secretions, they naturally migrated; or, their nutrition being materially modified, owing to these circumstances, they may perish and be discharged dead.

Indirectly, gastro-enteritis and every variety of irritation, may occasion the development of those parasites; but only, as Andral has remarked, because they derange the functions of nutrition and secretion.*

It has been a question, oft agitated, whether worms ever occasion disease? whether they are not harmless occupants of the bowels? and whether they may not be useful, by feeding on un-

* 'Precis d'Anatomie Pathologique,' i. 519, and ii. 184.

digested matters and thus keeping the stomach and bowels clean?

The last idea may be thrown out of the inquiry, like the efforts of nature, to which we have previously drawn attention; and the consideration of the second will be considered in that of the first.

If we reflect on the mode in which these parasites are formed, and the gradual manner in which they must be developed, whether the germs be received from without, or evolved spontaneously within the stomach and bowels, it would seem, that the parts must become accustomed to their presence, and that, therefore, they are not likely to produce irritation, or to give rise to symptoms that could indicate their presence.

Almost every animal has its entozoa, which appear as it were, natural to it; existing within almost all at some period of life, and becoming multiplied to a great extent only, where circumstances are present in the body to favor such multiplication. When, therefore, we meet with them in an unusual number, in any case, our attention has to be directed to the condition of the system producing them, more than to their destruction, although we endeavour to combine both objects.

As a proof that entozoa give rise to no pathognomonic signs, even when they may be present in an unusual quantity, it is but necessary to point out some of the symptoms that have been considered to indicate their existence in the alimentary tube:—Tumid, pale, or livid face; lower eyelid of a leaden color; itching or sensation of tension felt in the nose; sense of smell depraved, or lost; epistaxis; discharge of saliva during sleep; fœtid breath; stridor of the teeth; mucous sordes on the tongue; stammering; aphonia; loss of articulation; strabismus; retraction, contortion or fixedness of the eyes; dilatation and immobility of the pupil; objects appearing yellow; sudden amaurosis; moroseness; stubbornness; frightful dreams; cries, and terror, when awake; chorea; risus sardonius; vertigo; delirium; and stupor,—such are symptoms, referable to the head alone, which are asserted to have been present, and to have been produced by worms.

In the chest:—dry, tickling cough; sobbing; interrupted sighs, like those of children; anxiety; pleuritic pains; failure of milk in nurses; hiccup; sensation of a foreign body rising slowly from the stomach along the œsophagus; and one instance is mentioned by Frank, of worms reaching the nasal fossæ, and falling into the larynx, so as to produce suffocation.

In the abdomen:—Irritation in one or more points of the

intestinal canal; and sympathetic effects in the whole length; insatiable hunger, with progressive emaciation; appetite variously modified; sometimes nausea, retching, cardialgia, vomiting and expulsion of worms from the mouth; borborygmi; sudden swelling of the abdomen, now and then simulating pregnancy; a sense of coldness, gnawing, or tearing in the intestines; inanition; palpitations; sensation of an extraneous body creeping, becoming elongated, or retracted upon itself; partial tumefaction of the abdomen; meteorismus; eructations; intussusception; tormina; spasms; colic; retraction of the abdominal parietes; tenesmus; hemorrhoidal symptoms; discharge of mucus *per anum* or *per vaginam*; mucous diarrhœa containing very fetid, black fæces; the debris of rotten worms; the annuli of the tænia; or worms rolled in the form of a ball; obstinate constipation; derangement of the menstrual secretion; abortion; whitish or thick urine; dysuria; ischuria; obstruction and inflammation of the intestines, &c., &c.

Such is a list of the most prominent symptoms ascribed to worms; yet, except the discharge of the worms themselves, there is no one that unequivocally indicates their presence in the alimentary tube. M. H. Cloquet thinks their chief signs are,—dilatation of the pupil; itching of the *alæ nasi*; sour smell of the breath; lividness or paleness of the countenance; irregular digestion; emaciation; feeling of creeping or tearing in the abdomen, and salivation;* but all these symptoms are extremely equivocal, and may be produced by other morbid conditions. The itching of the *alæ nasi* has, by many, been regarded pathognomonic; but it does no more than shew the existence of irritation in the alimentary tube, not that such irritation is caused by worms. It is very common, as before remarked, for irritations to exist in the mucous coat of the viscera, and yet for such irritation to exhibit itself only at the part where the mucous membrane commingles with the skin.

It has been asserted by some writers, that perforation of the intestinal canal may be produced by worms; but this, to say the least of it, is doubtful. Frank affirms, that during a practice of fifty-four years duration, in which he opened several thousand bodies, he never met with one instance, which could be rationally attributed to these parasites. Garman has related a case, where more than one hundred worms were discharged from an abscess in the pubic region communicating with the intestines; Schellhammer, one of lumbrici discharged from an abscess in the inguinal region:

* 'Faune des médecins,' ii. 28.

Huenerwolf, a case of enteritis with perforation from worms: Heister and Coith, cases of lumbrici found in the cavity of the abdomen, with the intestines perforated; and many such cases are related in the books; but it is probable, that the perforation was caused by some ulcerative process established in the intestines, and not by any direct perforation, effected by these animals; and in all the instances in which an examination has been made of the perforated parts, their appearance has somewhat confirmed this view; the opening in the intestines being considerable,—not like what might be expected to be produced by worms, but by some morbid and destructive process, established in the intestine. Such are the opinions of the distinguished helminthologists, Bremser and Rudolphi; and the view is confirmed by Jules Cloquet, in the excellent prize essay on the Anatomy of the *Ascaris lumbricoïdes* &c., which was crowned by the *Académie Royale des Sciences* of Paris, in 1818, and to which I have referred. He asserts, that the worms are always free in the intestinal canal, and never adherent to its inner paries.*

After this picture of the general symptoms produced by worms, we are led to the inference, already expressed by anticipation, that each, and every of them, with the exception of the discharge of the worms themselves, may occur from other causes than the presence of these entozoa, and with this inference M. H. Cloquet concurs.†

Were the evidence, in proof of this, inconclusive, the matter would be set at rest by the observations of Professor Chapman, who, notwithstanding, regards worms as the cause of much mischief to the economy. After speaking of the views of those, who have affirmed, “that worms are highly useful in executing the duties of scavengers, removing the indigested sordes, and preserving clean the stomach and bowels,”—he adds:—“Nothing is less correct, or would be more dangerous than this extravagant notion, if carried into practice. Whoever is conversant with the complaints of children, and has attended to them, without any of those prejudices, which pervert the judgement, must acquiesce in this sentiment. I have had, again and again, occasion to witness a variety of diseases, which either originated or were kept up and aggravated, by the irritation of worms. There is, indeed, scarcely a complaint, which the presence of these animals will not excite or irritate. Cases are recorded of their producing epilepsy, catalepsy, chorea, tetanus, apoplexy,

* ‘Op. citat.’ p. 6.

† ‘Faune des médecins,’ ii. 41.

mania, hydrocephalus, ophthalmia, perverted vision, paralysis, especially of the muscles subservient to speech, syncope, palpitations of the heart, hiccup, dry cough, pleuritic pains, consumption, cynanche trachealis, rheumatic pains of the joints, dysentery, convulsions, &c.; to these may perhaps be added a peculiar fever termed *verminosa febris*. This is a slow and irregular remittent. The exacerbations are attended with heavy drowsiness: the remissions with a morbid vigilance. There is pain in the bowels, and at the pit of the stomach, with occasional purging, and a good deal of gastric distress. The head is much affected, sometimes painfully, though, for the most part, with stupor or delirium. The eye is wild, the pupil dilated, the alæ of the nose contracted, the cheeks flushed, the forehead polished as if glazed. The case, in short, presents so many of the appearances of hydrocephalus, that it is easily mistaken for that disease. Two symptoms, however, most commonly attend, which are peculiar and distinctive. These are a very *strange alteration of voice*, and, in some instances, a *total loss of speech*. But it is proper to state, that by Butter,* (and, Dr. Chapman might have added, by many others,) “a name which holds a respectable place in the annals of our science, it is positively denied, that this species of fever is at all occasioned by worms. It is contended by him, and with no little plausibility, that it proceeds entirely from crude accumulations in the intestinal passages, and he recommends, for its cure, purging. In a majority of cases, I think he is right, though it is still manifest to me, that he has laid down his position too generally, and without making those exceptions, which are found sometimes to exist.”*

Yet, in spite of this feeble testimony, he adds the following *non sequitur*—as I regard it—from his premises. “Considering, therefore, worms as a cause, and a very serious cause, too, of disease, I shall endeavour to point out the symptoms by which the different species may be distinguished, and to assign to each the appropriate set of anthelmintics.” He is constrained, however, ultimately to infer, that no one of the numerous symptoms, which he describes, is conclusive evidence of the presence of worms; although, he thinks, if several of them concur, there can be little doubt of the fact, and resort may be had to the appropriate remedies.

We are evidently justified, then, in the conclusion, that the appearance of the worms in the discharges is the only positive

* ‘Op. citat.’ ii. 6.

evidence of the existence of these parasites in any particular case; that their extrusion is by no means an evidence, that the symptoms, under which the patient may be at the time laboring, are caused by them, but rather, perhaps, that the supervention or disease has occurred coincidently only, and that the situation having become uncomfortable to them, in consequence of the changes induced by such disease, they have died or migrated ;—that we cannot, therefore, assert positively, that the presence of these entozoa ever occasions serious irritation, of the kind described by authors, although I am not disposed to uphold the negative side of the question so dogmatically as the supporters of the affirmative side have, in the absence of adequate testimony, maintained their views : and, lastly—what is the most important part of the inquiry, in a therapeutical respect—that the copious discharge of entozoa should attract the practitioner's attention to the state of the system, which gives occasion to their unusual propagation, and to rectify this, otherwise his true anthelmintics, or worm destroyers, may be administered in vain.

It has been attempted to indicate the symptoms, occasioned by the particular varieties of worms, but, where the general semeiology is so obscure, the particular must be so likewise. The *ascarides vermiculares* have, however, one symptom attending them, which sufficiently indicates their presence. This is a troublesome, and almost insupportable itching within the anus, which, in many instances, is experienced more at evening, and during the night ; and is produced by the worms coming in contact with the sensible extremity of the mucous membrane. Occasionally, they creep out of the rectum, or induce procidentia ani ; and tenesmus is by no means an unfrequent concomitant.

Of the existence of other varieties of entozoa we have no pathognomonic symptoms. In proof of this I need adduce nothing stronger than the fact, that Dr. Eberle—who is generally cautious in his assertions, and philosophical in his deductions,—has observed, and without comment, that “ it is stated by authors, that persons, affected with *tænia*, become uneasy and ill whenever they hear music, particularly the music of an organ at church !”^{*} This is upon a par with many of the antique prejudices, that prevail on the subject of intestinal worms,—not simply amongst the people, but amongst the members of the medi-

^{*} ‘ A Treatise of the Materia Medica,’ &c. vol. i. p. 152. Sec. edit. 1825.

cal profession. Too often, indeed, when obscurity exists about the diseases of irritation—so common in childhood—the physician invokes worms; and as the popular feeling cherishes the idea of mischief from this cause, the diagnosis is held to be entirely satisfactory. A plan of treatment is adopted, which removes the affection, and is at the same time *regarded* as vermifuge; and if the patient recovers, and especially if entozoa be discharged, it is looked upon as “confirmation strong,” that these parasites have been the cause of the whole suffering, although the true explanation may be;—that they have migrated in consequence of their residence having become, owing to alterations produced by disease, or by remedies, uncomfortable to them.

Whilst the causation of worms in the intestinal tube was disregarded, attempts were altogether restricted to the discovery of such agents as appeared to be detrimental to entozoic existence, or of such as most effectually dislodged them, and the number, brought forward with such pretensions, has been prodigious; yet but few are employed at the present day, and this partly—indeed chiefly—because the main object of the practitioner is now properly considered to be to prevent their fresh generation.

Numerous experiments have been instituted on worms, which have been voided,—under an expectation, that some light might, in this way, be thrown on those agents that would probably be most detrimental to them whilst in the body.

Redi* undertook several experiments on the human *ascarides lumbricoïdes*, of which the following is a partial summary:—in cold water, they lived from sixty to seventy hours; in an infusion of coralline, more than sixty hours; more than thirty in water rendered bitter by aloes. In water, saturated with salt, they died speedily; in brandy, still more speedily; in syrup—and the experiment was often repeated—within three or four hours. In wine, one lived twenty-four, another forty, and a third seventy-four hours.

It has been a question, whether the fatty oils are noxious to worms. They who believe, that, like insects, they are furnished with spiracula, have thought, that, by pouring oil upon, or anointing them, the spiracles would become obstructed, and hence the animal would die. The human entozoa are not, however, furnished with spiracula, nor do experiments prove the noxious

* ‘*Degli animali viventi*,’ &c., 126 to 130.

agency of oils. Coulet affirms, that he found the *tænia solium* live as long in oil of almonds as in any other fluid. Arnemann, found, that human *Ascarides lumbricoïdes*, as well as those of the swine, lived several days in oil, when kept in a warm situation. They were in all cases, however, affected with restlessness and contortions; but their bodies became gradually languid and lax: the movements were executed with difficulty, and, as it appeared, painfully, and the skin was contracted into rugæ. In the oil of sweet almonds, a lumbricus of the hog lived twenty-seven hours; another thirty; human lumbrici, from forty-six to fifty-three. In the oil of bitter almonds, the lumbrici of the hog lived eighteen, twenty-four, and thirty-nine hours; whilst the human died within thirty-four. In castor oil, those of the hog lived fifty-six; the human, from forty-four to forty-eight: the *distoma hepaticum*, eight: in linseed oil, those of the swine from eighteen to twenty; the human from twenty-three to twenty-six. In oil of walnuts, those of the swine, twenty-two; the human, twenty to twenty-five. In oil of the hazelnut, those of the hog, nineteen; the human, twenty-six. In the oil of poppy, those of the hog, twenty; the human, seventeen, twenty-two, and twenty-seven. In the oil of elder, those of the hog, twenty-eight; the human, two and three. In the oil of hyoscyamus, those of the hog, eighteen and twenty-two; the human, twenty-seven. In the oil of beech, those of the hog from twenty-nine to thirty-two; the human, forty to forty-six. In the oil of hemp, those of the hog, sixteen and twenty-three; the human, twenty-seven. In the oil of mustard, both those of the hog, and man, thirty-six. In rape oil, those of the hog, twenty-one to twenty-six; the human, twenty-eight; and in the oil of behen the human lived twenty-six hours.

None of these experiments, however, were as satisfactory as those, instituted by Chabert with his *empyreumatic oil*, which consists of one part of the fetid or empyreumatic oil of hartshorn, and three of the essential oil of turpentine, subjected to distillation. Every kind of worm, immersed in it, was killed either immediately, or after the lapse of a few minutes.

The preparations of turpentine, are, indeed, amongst the most detrimental to entozoic existence of the substances with which we are acquainted.

Anthelmintics, according to the definition given of them generally at the present day, may be divided into four classes.

First,—True anthelmintics. *Secondly*,—Mechanical anthelmintics. *Thirdly*,—Agents, that expel worms by acting on the intestinal canal. *Fourthly*,—Agents, that prevent their formation.

Of the ‘true anthelmintics,’ or those which prove destructive to entozoic life, by virtue of some principle, poisonous to them, which they contain, there are but few employed in ordinary practice; yet the lists of the *materia medica* supply us with a host of such remedies. The preparations of turpentine, especially the oil, united, or not, with the empyreumatic animal oil obtained during the distillation of hartshorn, are decidedly the best; but it is obvious, that these and every other heating agent, cannot be adapted for cases in which the production of the worms is accompanied by any thing like the gastro-enteritis of Broussais, and, indeed, in every case, their improvident employment is liable to induce that debility of the digestive function, which I have described as the great predisponent of worms.

If the proper administration of these agents fails to destroy the parasites, but little dependence can be placed upon any of the other means,—as the *spigelia marilandica*—the *chenopodium*—the *semina santonici*; and the hundreds of agents, that have been looked upon as eminently vermifuge. Recently, Dr. James Johnson, of London, has recommended a strong decoction of the *helminthocorton* as “the most powerful of *all* anthelmintics,” and he says, that when thrown into the rectum, it “destroys any worms domiciliating there as effectually as choke-damp would destroy the life of a miner.”*

It will be scarcely credited, that M. H. Cloquet—a man of unquestioned science, but, to judge from this, of slender qualifications as a Therapeutist—has put the “aqueous decoction of the *hydrargyrum purificatum*” at the head of his list of anthelmintics.† He observes, also, that he has seen the *ascarides lumbricoïdes* evacuated, in a state of torpor after the abdomen of the patient had been rubbed with a mixture of ox’s gall, and common soap, with the oil of tansy, or of camomile, strongly impregnated with camphor, and garlic; or with milk, holding aloes in solution, impregnated with the bitter principle of the *colocynth*, and camphor; or with a maceratum of bruised garlic in camphorated sulphuric ether. A like effect, he says, is produced by a plaster composed of yellow wax, litharge, assafœtida, and galbanum

* ‘*Medico-chirurgical Review*,’ for April, 1834, p. 450.

† ‘*Faune des medecins*,’ ii. 151.

He also recommends an application, which is neither the most elegant, nor readily attainable;—assafœtida dissolved in the gastric juice! “or, what is more simple, in the saliva.” Other external applications have been recommended by Laennec, Barton, &c.: their action, however, may, in all cases, be explained in one of two ways. The terebinthinate, alliaceous, or highly odorous agents, may be absorbed into the system, and, in this way, come in contact with the entozoa, but it is not probable, that they can affect them, in a state of sufficient concentration, to be detrimental. This explanation will not, however, apply to others. There is every reason for believing, that the frictions, cataplasms &c., act as indirect anthelmintics only, by improving the activity of the gastric and intestinal operations, and thus removing the grand predisposition.

Of the ‘mechanical anthelmintics,’ two only are now in general use. In the United States, indeed, neither of these is much employed, but in Great Britain they have by no means outlived favour. These two are the filings of tin, or ‘granular tin,’ and the *dolichos pruriens* or ‘cowhage.’ Alston, Pallas, Bloch, Marx, Brera and others have strongly recommended the former, in cases of *tænia solium* especially. Alston conceived its good effects to accrue from its combination with arsenic; but this idea has been overturned by the equal success attainable from its exhibition in a pure state. The mode, in which it acts, is probably altogether mechanically; the particles of tin exciting incessant annoyance as they pass over the bodies of the worms, thus rendering the habitation uncomfortable to its occupants, and inducing them to migrate; whilst the friction on the mucous coat of the intestines increases their peristaltic action and favours the object; or, if it fails to do this, it augments chylosis, and improves the tone of the digestive functions in general.

The mode, in which the pubes or down of the *dolichos pruriens* acts, as an anthelmintic, is by no means clear. That it is disagreeable, and destructive to these parasites, is proved by the experience of Kerr, Cochrane, Bancroft, Macbride, Chamberlaine, and other observers. Yet its agency has been denied, on the ground, that, if it possessed any influence over worms, it ought equally to irritate the mucous coat of the intestines, over which it passes, which is not the case—and there is much plausibility in this; but, unless we deny the accuracy of the testimony adduced, we are compelled to admit, that some decisive mechanical effect is exerted by it on the worms. Moreover, the

mucous membrane, lining the stomach and viscera, is by no means sensible to the extent that has been often imagined. Rudolphi* has properly remarked, that wounds of the stomach and intestines, have sufficiently exhibited this ; and we know, that the mucous lining of the stomach is frequently affected with inflammation, and even partial or total disorganization, without any symptoms being present to sufficiently account for the existence of so severe a lesion, which death alone, perhaps, has clearly pointed out. In the case of fistulous opening into the stomach, which I have described in another work,† when an elastic gum tube was made to press on the lining membrane of the stomach, no sensation, except that of a foreign body pressing against it, was induced.

The substances, that expel worms by acting on the intestinal canal, belong to the head of cathartics ; but these must not be of a violent character, or often repeated, owing to the debility they are likely to induce in the digestive organs. The occasional exhibition, of a brisk cathartic is often a valuable agent, in not only removing the worms, but in stimulating the gastric function to a more healthy action, and thus removing the predisposition. By exciting, too, the intestines to throw off the retained fæces, and secretions,—in which the worms are often enveloped, and find a nidus favorable for their generation,—they enable those anthelmintics, which may be prescribed, to come more immediately into contact with the parasites, and they should, consequently, be made to precede the use of those remedies. Nor is it alone prior to the administration of anthelmintics, that cathartics are useful. When the former have been administered for a few days, and there is reason to hope, that they have occasioned the death of the worms, a brisk cathartic may be advantageously given for the purpose of removing any accumulation of dead animal matter, that may have taken place, and thus of diminishing the tendency to a fresh generation.

The class of ‘agents that prevent the development of entozoa’ is, after all—as has been more than once observed—the most important. If any symptoms of gastro-enteritis should exist, they must of course be removed ; but generally, in my opinion, such is not the case, although the prime predisponent is

* ‘Entozoorum Synopsis,’ etc., p. 490.

† ‘Human Physiology,’ Second Edit. i. 514 ; and ‘Elements of Hygiène,’ p. 216,

doubtless seated in the gastro-enteric organs. Accordingly, the tonic system of medication is indispensable; and those agents, which are found to aid chylosis, prove the most valuable. Charcoal has long had a character for being anthelmintic, and it is well known, that it has been, and is, constantly mixed with the food employed for fattening fowls for the markets of large towns. The charcoal contains no soluble matter, but, by grating over the mucous membrane of the stomach and intestines, it stimulates the organs, concerned in digestion, to greater activity, and enables a larger quantity of chyle to be separated from the food taken along with it, than could be accomplished without its agency.

Such is the fact, likewise, with regard to salt—the ‘condiment of condiments,’ as it has been, not improperly, termed. Where children are not allowed a proper quantity of salt with their meals, they have been observed to be extremely liable to the generation of these parasites; and therefore a due allowance is always to be permitted, and recommended. The agriculturist administers it liberally, for the prevention of invagination in his cattle; and it is occasionally given to both animals and man, as a true anthelmintic: Redi, as was before observed, found, that entozoa soon perished in a saturated solution of common salt, when out of the body. Fortunately, it is much liked by children, who have apparently a natural taste for it, as is the case with the individuals of the animal kingdom: the buffalo of our own country daily frequents the ‘salt licks’ of the west to enjoy the treat; and all our domestic cattle lick it with the greatest delight.

In the twenty-ninth volume of the ‘London Medical and Physical Journal,’ Mr. Marshall has published the case of a lady, who had a natural antipathy to salt—which is rare—and who was dreadfully infested with worms during the whole of her life. In Ireland, according to Dr. Paris,* where, from the bad quality of the food, the lower classes are very subject to worms, a draught of salt and water is a popular, and efficacious anthelmintic, and Lord Somerville, in his address to the English Board of Agriculture, refers to the effects of a punishment, which formerly existed in Holland. “The ancient laws of the country,” says his lordship, “ordained men to be kept on bread alone, UNMIXED WITH SALT, as the severest punishment that could be inflicted upon them in their moist climate. The effect was horrible; these

* ‘A Treatise on Diet.’ New York Edit. 1823, p. 78.

wretched criminals are said to have been devoured by worms engendered in their own stomachs.”*

Where the practitioner is desirous to destroy the worms, his management may have to be somewhat modified by the particular variety; but, as the symptoms, which distinguish these from each other, are by no means unequivocal, the treatment must be obscure also. This is, however, of the less consequence, as all entozoa are induced by the same causes, and more or less affected by the same vermifuges. As the *ascarides vermiculares* occupy the lower part of the bowels, and occasion a troublesome itching within the rectum, their presence may be suspected, and medicines can be introduced to act upon them immediately, by the way of injection; aided, or not, by anthelmintics administered by the mouth. In all cases, perhaps, it would be better, that they should be placed, in this way, between two fires, as it were, as they have been found even in the upper part of the alimentary tube, whence they have been ejected by vomiting; and it is not by any means improbable, that the annoyance, occasioned by a clyster, might induce them to migrate, for the purpose of seeking quiet in the higher portions of the intestines; or at least of getting rid of the irritation to which they may have been exposed in the lower portion.

Besides those entozoa, which are peculiar to the human intestines, Dr. Good has given the term *helminthia erratica* to “ectozoa or worms, or the larves of insects, introduced by accident, and without finding a proper habitation in the stomach or intestines, producing spasmodic colic with severe gripings; and occasionally vomiting or dejection of blood.”† The animalcules, which have thus been most commonly swallowed, are the hair-worm; the leech; the grubs of the fly, of the caddy insect—*phalæna pinguinalis*; the larves of the bee, the spider, the *triton palustris*, *lacerta aquatica*, &c. All these, from change of locality, and other causes, are greatly altered in structure from those that are seen out of the body; so much so, indeed, that it is, at times, very difficult to determine the exact species to which they belong. Of all the erratic worms and grubs, the *hirudo sanguisuga*, or horse-leech, would seem to undergo the greatest metamorphosis; in one case, it is reported to have attained the size of a man’s fist, and to have contained a pound and a half of blood.‡

* ‘Elements of Hygiène.’ p. 310. † Good’s ‘Study of Medicine.’ vol. i.
‡ Good, loco citato.

When there is reason to suspect the presence of any of those adventitious animalcules, their treatment must be guided by general principles, which will be obvious on the slightest reflection. First destroy, by any of the true anthelmintics, and then aid their expulsion, by any of the ordinary cathartics.

TABLE

OF THE CHIEF ANTHELMINTICS, AND THEIR OFFICINAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Chenopodium. Wormseed. (The seeds of the <i>Chenopodium anthelminticum</i> , or 'Jerusalem oak' of the United States.)	{	.....	gr. 20 to 60.
		Oleum Chenopodii. (The distilled oil of the seeds.)	m 4 to 8
Dolichos. Stizolobium. Cowhage. (The bristles of the pods of the <i>Dolichos pruriens</i> .)	{ From the E. and W. Indies. }	.....	{ 1 teaspoonful to 2 or 3.
Oleum animale Dippelii. <i>Dippel's animal oil.</i>	{ By distilling animal matters—especially hartshorn—on the naked fire. }	.....	m 5 to 20.
Oleum Terebinthinæ. Oil of turpentine.	{ By the distillation of common turpentine. }	.....	f. ½ oz. to f. 1 ½.
Sodii chloridum. Sodæ murias. Chloride of sodium. Common salt.	{ From sea water and salines. }	.....	½ oz. to 1 oz.
Spigelia, Pink root. Carolina Pink root. (The root of the <i>Spigelia marilandica</i> .) Indigenous.	{	.....	gr. 10 to 60.
		Infusum Spigeliæ. (Spigeliæ rad. ½ oz.; aq. bull. O j.)	{ f. ½ oz. to f. 1 oz
Stanni Pulvis, Powder of tin. Granular ttn.	{ By melting tin in an iron vessel and stirring whilst it cools. }	.....	dr. 1 to oz. ¼.

SECTION IV.

ASTRINGENTS.

Definition of astringents—Tannin, the great vegetable astringent principle—Their *modus operandi*—Act best on parts with which they come in contact—Bad effects of astringents—Indirect astringents—Therapeutical application—In fevers, inflammations, hemorrhages, &c.—Astringents often used by the surgeon—Styptics.

Astringents* are defined, by Dr. A. Thomson,† to be substances, which produce contraction and condensation of the muscular tissue; but, in his table of classification, he ranges them amongst the vital agents, which operate on the “muscular and sanguiferous systems.” There is no reason, however, why their operation should be restricted to those systems. They affect also the skin, mucous membranes, cellular tissue, and the glandular, and parenchymatous organs;‡ and a better definition would be, simply, “agents, that occasion contraction, and condensation of the tissue of organs.”

The inconsistency in the two definitions by Dr. A. Thomson, given above, is much less than that developed in a subsequent part of his section on astringents, where he proceeds to give his theory on the nature of astringency. By a reference to his table of classification, at page 85, it will be found, that he separates *Excitants*, *Sedatives*, *Refrigerants*, *Narcotics*, and *Antispasmodics*—which operate directly on the nervous system—from *Tonics*, and *Astringents*—which operate on the muscular and sanguiferous systems; yet, the development of his theory, regarding the action of the last class, shews convincingly, that he ought to have referred it to the division, which comprises the various agents, that act directly on the nervous system. “I conceive it to be a power,” he remarks, “which, through the medium of the motor nerves, acts on the *insensible* contractility of the muscular fibril,

* Constringentia, contrahentia, stegnotica, syneritica, astringentia.

† Elements of Materia Medica and Therapeutics, ii. 1.

‡ Taaschenbuch der Arzneimittellehre u. s. w. von E. S. Schroff, und K. D. Schroff. Wien, 1833, p. 165.

producing a closer approximation of their component particles and, by thus augmenting their cohesion, causing a greater and more permanent density, and a corresponding vigour in the muscular tissue. This action differs from ordinary muscular contraction, in not being dependent on the nerves of sensation, and consequently in not being the result of any communication with the sensorium; in not exhausting excitability; and in the permanency of its effects. The movements constituting muscular contraction are the consequence of impressions conveyed to the brain, through the sensitive nerves, and thence to the motor nerves of the part; the contractions following the application of astringents are the result of direct impressions on the motor nerves themselves, altogether unconnected with those of sensation.”*

It is doubtful, whether any such direct agency on the nerves, as that advocated by Dr. Thomson, is exerted by astringents. It is more probable, that the primary effect is upon the intimate tissues of organs, as astringents are capable of producing condensation and contraction in parts that are deprived of the vital influence; and, although much has been said against the idea, that any thing like tanning can be effected upon the living tissues by the operation of this class of medicinal agents, the explanation does not appear to me as wide of the mark as it has been conceived to be by many. The vital influence prevents the precise chemical changes from being effected—the requisite union of the gelatine of the skin, for example, with the tannin of oak bark—but it does not prevent the condensation and corrugation of tissue; something similar to which is produced in the dead fibre, and in vegetables,—organized bodies that are devoid of nerves.

Astringents may be used internally,—either for the purpose of acting upon the parts with which they come in contact, or indirectly on distant parts—or externally, particularly with the view of arresting hemorrhage, when they are called ‘styptics;’ and a difference has been made amongst these, according as they act chemically or mechanically;—the chemical styptics coagulating the blood exuding from the part, and, at the same time, stimulating the tissues to contraction; whilst the mechanical—as felt, agaric, lint, &c.—detain the blood in their meshes, or absorb it, until it coagulates, and thus arrests the hemorrhage.

Astringents can be readily detected by the taste. They convey a sense of roughness to the palate, which cannot be mistaken,

*Op. cit. p. 11.

but which is more marked in some substances than in others. It is in this way, that the mineral acids,—alum, and the various metallic salts, and vegetables,—are readily detected as astringents.

The vegetable kingdom furnishes largely to this division of therapeutical agents; and the property, on which their virtues are mainly dependent, is tannin—the *principium scytodephicum*, or *Gerbestoff* of the Germans. This is associated with Gallic acid in the *Krameria*, *Tormentilla*, *Uva Ursi*, &c.

The action of astringents, when taken internally, may be altogether local on the tissues with which they come in contact, or the excitant effect,—for it is excitant,—may be communicated to other parts of the frame, as in the case of tonics; so that the action of organs at a distance may be modified, and immoderate discharges from them be, in this manner, arrested. When such is the case, the hemorrhage may be controlled, in consequence of a simple tonic influence exerted by the astringent; for it is not easy to see how the effect of the astringent itself can be extended beyond the part it immediately touches; or, the astringent principle may pass into the mass of blood by absorption, and come in contact with the vessels whence the immoderate discharge is proceeding. This we say *may* be the case, but it is difficult for us to conceive, that a small dose of an astringent substance, received into the blood, can proceed to the seat of an undue flow—a profluvium—and there act in sufficient concentration to produce any considerable astringent agency; yet this is the *modus operandi* invoked by many writers. Dr. Thomson, indeed, asserts, that, “without such a supposition, we should not be able to explain the manner, in which they (astringents) act in stopping hemorrhage when internally administered, especially when taken into the stomach;” and he adds:—“Mr. Brodie gave a patient, who had a frightful hemorrhage from the prostate gland, and in whom all other remedies had failed, a dose of Ruspini’s styptic,* and repeated the dose twice in the course of twelve hours. About half an hour after the first dose was taken, the bleeding ceased, and it never recurred.”†

Still, this case is insufficient to establish the fact of absorption; and, without meaning to deny, that the styptic did, in that case,

* This styptic, according to Dr. Thomson, consists of gallic acid, a small quantity of sulphate of zinc, and of opium, dissolved in a mixture of alcohol and rose water; but, as the quantity of sulphate of zinc, and of opium appears too small to influence the medicine, a simple solution of gallic acid in diluted alcohol, he conceives, will answer all the purposes of the expensive nostrum.

† Op. citat. p. 10.

exert some agency in arresting the hemorrhage, I do not think, that one solitary case of the *post hoc* is sufficient to establish the *propter hoc*. Dr. Thomson himself admits, that he has not witnessed its influence, as an internal or general astringent, although he has frequently observed its power in checking the most obstinate bleedings from leech bites in children, after all other things had failed.*

Another mode in which astringents may act, in certain cases, is by passing into the mass of blood, and increasing the tendency to coagulation of that fluid.

It is manifest, that in all increased discharges, which occur from parts that can only be reached through the medium of the circulation, no signal advantage can be expected from the administration of astringents; on the other hand, where they can come into immediate contact with the seat of the disease they may be implicitly relied upon, so far as their properties will admit. Accordingly, in hæmatemesis and epistaxis, and in chronic diarrhœa, and dysentery, their action is more marked than in hæmoptysis, in immoderate flow of the menses or in leucorrhœa; inasmuch as, when taken internally, they can only act in the lungs, uterus or vagina, either by the impression they make on the general system, through the nerves of the stomach, or by being taken into the circulation.

Under the view, every where embraced by Professor Chapman, in his 'Elements of Therapeutics,' that the vital action of parts resists any thing like chemical change;—that "so long as vitality endures, every chemical action or combination is repelled by powers and resources peculiar to the animated condition,"† the *modus operandi* of astringents becomes a weighty stumbling block. "Nevertheless," he remarks, "there would seem, at the *first view*, to be a class of articles endowed with the property of corrugating or contracting the living fibre. This is especially evinced by the sensation, which they impress upon the tongue and fauces; and, perhaps, still more conspicuously by their efficacy in restraining hemorrhages from wounds. Yet how they operate has never been very intelligibly explained. Their effects are ascribed altogether by Darwin to the power of promoting absorption. Whether they have such a property is exceedingly doubtful. Conceding it to them, however, it will not, in the slightest degree, account for their suppression of hemorrhage."

* Op. cit. p. 47.

† Vol. ii. 310.

This is all he says of the general *modus operandi* of astringents. He offers no view of his own; and, indeed, appears to doubt, whether there are any agents endowed with the property of corrugating or contracting the living fibre; inasmuch as he says, there would 'seem, at the first view,' to be a class of such articles; leaving the inference to be deduced, that farther examination would exhibit its nonexistence. We can have no more doubts, however, of the astringent agency of such a class of substances,—modifying the condition of the living fibre, in the mode mentioned,—than we have of the reality of such agents, as cathartics, emetics, or narcotics.

In all cases where profuse discharges have to be checked, it is important to inquire, whether they are accompanied by any unusual activity of vessels, or, in other words, whether they are of the kind, generally regarded and denominated 'active,' or whether they are 'passive.' Some have denied, that there can be such a state as passive hemorrhage, but we can readily understand, that there may be a condition of vessels in which their texture is so loosened, as to permit the blood to transude with facility from within to without; and, accompanying, or not, this condition, there may be a degree of fluidity and impoverishment of the blood, which may adapt it for a more ready transudation, than when it contains more fibrine, and red globules. I have recently visited a young female, who, in consequence of hyperæmia of the encephalon, has been bled every fortnight for the last few months, to the extent of a quart or more; and in whom it has been an object of moment to break in upon the habit thus induced. Her whole appearance is anæmic. She is pale, apparently almost exanguious; the pulse small, and indicating the presence of but little blood in the vessels; yet, at the usual interval of a fortnight, signs of augmented action in the vessels of the head supervene; and it has been hitherto esteemed indispensable to repeat the blood-letting. My endeavour has been to gradually break in upon this habit;—to cup her, when the encephalic symptoms make their appearance; and, by revulsives, to direct the afflux of blood elsewhere. To-day, however, it has been necessary, in consequence of the supervention of delirium, to take away a pint of blood, and this is largely composed of serum; affords, indeed, the strongest proof of the form of hypæmia, of Andral, which is characterized by impoverishment and deficiency of the circulating fluid. The original mischief was here probably in the great nervous centres, and bloodletting was doubtless, in the first instance, appropriate, but the frequent repe-

tition of bloodletting, we shall find, is well adapted to lay the foundation for periodical irregularities of circulation like those under which she is suffering. The case is an elucidation of the fact—often referred to in these pages—that hyperæmia may be induced by agencies, which are regarded as best adapted for its removal, provided such agencies be pushed to an inordinate extent; and it as an additional evidence in favor of the importance of attending to the state of the nervous system in such cases, under whose influence hyperæmic affections are often developed, and where the indication of cure is less to withdraw the circulatory fluid than to allay the nervous irritability, that gives occasion to the excited state of capillary vessels, which constitutes most of the varieties of hyperæmia.

From what has been said, it obviously follows, that in acute inflammations of mucous membranes, accompanied by increased discharges, powerful astringents may be—to say the least of them—of doubtful propriety; whilst in chronic inflammations, where debility of capillaries exists, they may, like excitants, be the best class of agents that could be had recourse to. Care, however, has always to be taken with regard to their strength. Broussais has properly remarked, in one of his propositions, that “vegetables, which are astringent in small doses, produce gastro-enteritis when taken in large doses.” Prop. ccxlv. But this does not apply to the gastro-enteric mucous membrane solely. The sudden application of a powerful astringent condenses and corrugates the mucous tissue, so that the calibre of the vessels is diminished below the natural; the circulation through them is consequently obstructed, and hence supervenes increased action of the vessels that are continuous with the constricted capillaries. In another proposition (ccl), Broussais affirms, that the mineral astringents, the sulphates of alumina, of zinc, and of iron, act nearly in the same manner as the preparations of lead, except that the latter produce a truly deleterious effect on the nervous system: the primary action of all, he says, is stimulating; they all contract the fibres, and “afterwards diminish the innervation.” He asserts, too, that when astringents are applied so as to arrest the “serous elimination” of the skin, an internal exhalant action succeeds; and, as an instance of this, he adduces dropsies, which immediately follow the application of an astringent, that has repelled itch, tetters, and even acute inflammation—as erysipelas. “Similar dropsies have been sometimes induced by frictions with ointments containing sulphate of alumina, sul-

phuret of potassa, or baths impregnated with corrosive sublimate, employed for the cure of prurigo, or obstinate itch.”*

Without meaning to deny, that where an accustomed irritation has been suddenly repressed, it may be transferred elsewhere, and that where a long established drain is arrested, exhalation may be produced in other parts of the system, it is proper to observe, that I have never witnessed dropsy induced in the manner referred to by Broussais, nor am I disposed to admit, that it could readily happen. The surface, in a case of tetter, is so small, and the elimination, effected from the skin of the part, so trifling, that it appears improbable that any augmentation of internal exhalation could be induced—to such an extent as to give rise to dropsy—by astringent or other agents employed for the removal of the cutaneous eruption.

The astringent medication is considered, by many writers, under the head of tonics ;† and some of the substances in the catalogue of the materia medica eminently possess tonic or corroborant virtues. Such is the case with the cinchona ; yet, its chief virtues are not dependent upon this astringency, as the quinine possesses none of it. It is obvious that the efficacy of astringents may vary according to the principles, that are united with them, and this may give occasion to the exertion of some choice to adapt them to particular conditions of disease.

The most potent of the vegetable astringents are indebted for their properties to the tannin they contain, but many others have a bitter or an aromatic principle associated with the astringency, and have, therefore, been termed respectively, by the Germans, *amaro-adstringentia*, and *balsamico-adstringentia*, (*bitter-oder balsamisch-adstringirende*) as the *salix hippocastanum*, *juglans regia*, the *caryophyllata*, and especially the *cinchonæ*, &c.‡

Thus far I have referred only to the action of direct astringents ; but evacuations may manifestly be connected with different states of the living system ; so that agents, possessed of no astringent properties whatever, may yet check the discharges, or produce an astringent operation, indirectly. Hence we have ‘direct,’ and ‘indirect’ astringents, as we have direct and indirect tonics. Opium, for example, by allaying the augmented peristole in diarrhœa, may exert an action of astringency, and diminish the number of discharges ; and accordingly it is often had recourse to

* ‘Principles of Physiological Medicine, etc.,’ translated by Drs. Hays and Griffith, p. 429.

† J. W. H. Conradi, ‘Handbuch der allgemeinen Therapie,’ Cassel, 1833. s. 91.

‡ Conradi, s. 79.

in such cases. Again, the increased discharges of dysentery are induced by an inflammatory condition of the mucous coat of the intestines. Bleeding, therefore, by allaying this inflammation, and castor oil, given occasionally so as to gently remove the morbid secretions, by taking away the cause, may check the effects. A predominance of acidity in early infancy lays the foundation to many of the bowel affections, which are so common at that age, and keeps them up when once established. An antacid, by neutralizing the acid, takes away the cause, and thus becomes an indirect astringent. In active hemorrhages, where a condition exists closely allied to inflammation, the flow of blood is arrested by antiphlogistic remedies, which thus become astringents; and, lastly, cold is one of the most valuable of the indirect astringents, which we possess, especially in hemorrhages of the active kind. Much of this effect is, doubtless, produced by their temperant, antiphlogistic or refrigerant operation, which—we shall see hereafter—is signal. Where, however, the cold—as in the form of ice or iced water—can be made to come in contact with the bleeding part, it produces condensation and corrugation of the tissues; diminished calibre of the vessels; and coagulation of the exuding fluid, in the same manner as the substances, that belong to the class of direct astringents. When properly used, it is one of the most valuable astringents, which we possess.

With regard to the therapeutical application of an astringent medication, it need scarcely be remarked, that it is inadmissible in fevers, unless they should be complicated, in the latter stages, with symptoms specially indicating its employment. In intermittents, they have been frequently used, and often with decided advantage. Generally, however, the astringents, that have been employed in such cases, have possessed other properties on which their efficacy was dependent. I have already observed, that the different varieties of the cinchona contain a principle, which is not astringent, along with another that is; yet the former exerts all, or almost all, the power which the bark in substance is capable of exerting. At times, however, we meet with cases, in which the bark in substance succeeds, when the quinine has failed; and it is not improbable, that in such cases the astringent property may aid the tonic or febrifuge virtue in arresting the disease.

The influence of the tonic on the body is manifestly of a nervous character; and I have attempted to shew, that astringents are capable of exerting one of a similar nature; so that even when the latter are administered in an uncombined state, they may succeed in putting a stop to intermittents. Astringents are, however, but rarely employed—I mean the pure astringents—inasmuch as we possess such valuable agents of another kind for effecting all that they can accomplish, and more too; but there may be pathological conditions, during the existence of an intermittent, which may demand their use; as when the ordinary febrifuge tonics run off by the bowels, or when discharges supervene, which, if allowed to persist, might be attended with injurious consequences.

During the active stage of inflammations, the same rule applies to the administration of astringents as to that of excitants. Although occasionally employed with success during the violence of external inflammations, or those of the dermoid tissue, their efficacy is more decided after the violence of the inflammation has passed away, and when a state of overdistension of the extreme capillary is the chief pathological condition that keeps up the excited action of the vessel communicating with it. In some inflammations, however, their beneficial agency, like that of excitants, is marked from the first. Such are inflammations of the tunica conjunctiva, of the tonsils, velum pendulum, and of parts of the mucous membrane, which admit of being inspected,—as of that which lines the mouth and fauces—or which can be reached by them in their undiluted state,—as the inflammations, that characterize blennorrhœa or gonorrhœa, and leucorrhœa.

In conjunctivitis, occasionally from the first, and almost always in what is called the catarrhal variety, after the violence of the action of vessels has been somewhat got under by the employment of appropriate antiphlogistics, the advantage of the astringent metallic compounds—especially of the nitrate of silver—is often signal. As soon as it is dropped in solution into the eye, decomposition occurs, in consequence of its meeting with the chloride of sodium contained in the tears. It becomes converted into the chloride of silver, which is recognizable by its white appearance; but the constringency, exerted by it on the vessels, tends to restore them to their wonted calibre, and the evil is thus removed.

In that sluggish variety of sore throat in which the mucous

membrane, covering the tonsils, is of a diffused dusky red, extending over the velum pendulum and the uvula, and giving occasion to tumefaction and relaxation of those parts, excitant and astringent gargles are the best applications that can be used. The vessels are here loosely situated in the parts in which they creep; remora of the fluid, circulating within them, is consequently facilitated; turgescence results; and this state is not removed until the vessels resume their wonted calibre,—a result, which can be rendered more easy by the appropriate employment of astringents.

In the malignant affections of the throat, which are concomitants of some of the forms of scarlatina, the same class of remedies are employed as local applications; some vegetable infusion or decoction, which contains tannin, being generally invoked, with or without the addition of one of the mineral acids. The decoction of the cinchona, with the sulphuric or muriatic acid, is a common combination for this purpose.

In those affections, too, of the mucous membranes, which are attended with the formation of a pellicle or an exudation from the inflamed mucous surface, and which have been recently termed, by Bretonneau, *Diphtherites*;* astringents are found to be extremely useful after the violence of action has been subdued, and the pellicle has formed. The most successful of these, again, is the nitrate of silver. When this salt is applied in solution to the mucous membrane of the mouth in a case of aphthæ, or to the fauces in cases of diphtheritis of the pharynx, larynx or trachea, the new action, induced in the part to which it is applied, is extended to the membrane lower down, and the most salutary agency is, at times, exerted. Such appears to be markedly the result of the experience of Dr. Mackenzie. The exudation of coagulable lymph,—which the experiments of Schwilgué prove to correspond, in its properties, with coagulated albumen, and which constitutes the false membrane in cases of diphtheritis,—frequently begins on the surface of the tonsils, and thence spreads along the arches of the palate, and ultimately descends over the internal surface of the pharynx and œsophagus, as well as of the larynx and trachea. According to Mackenzie, the application of a solution of the nitrate of silver to the tonsils, velum palati, and uvula, frequently removes the albuminoid exudation; produces manifest relief of the symptoms, and ultimately dispels them. The solution he uses is twenty grains of the nitrate to an ounce

* 'Des inflammations spéciales du tissu muqueux,' &c. Paris, 1826.

of distilled water. Dr. Eberle asserts, that he has seen one instance in which this application was made, and the result gave him a very favourable impression of the practice; but he says it must be confined to the cases in which the fauces are found, on inspection, to present an irritated and inflamed condition. This is not, however, essential. The astringent effect upon the part of the mucous membrane, with which the solution is made to come in contact, may be propagated by continuous sympathy to the part of the trachea, lined by the false membrane; a new action may be induced; the albuminoid substance be detached, and ultimately thrown off, although it is obvious, that when a complete adventitious tube is formed in the trachea, and, of course, below the rima glottidis, the narrowness of the aperture into the larynx must, in by far the majority of cases, render the evacuation of the adventitious tube impracticable. With a similar object, Laennec directed the inhalation or insufflation of very finely powdered alum—another astringent—and he asserts, that it generally afforded great, and speedy relief, not only in tracheitis, but also in laryngitis, and in tonsillitis or amygdalitis.

I have more than once referred to the importance of examining, in all cases of hemorrhage, whether they are active or passive,—characterized, that is, by polyæmia, or hyperæmia, or by hypæmia or anæmia. In the former category, the use of astringents can in no wise be demanded. The fulness or the activity of vessels must be first reduced before the astringent medication can be at all invoked. In but few of the cases of hemorrhage does the blood flow from a ruptured vessel. It generally passes out by diapedesis or transudation, and this may be of course favoured both by fulness of vessels, and by any causes, that induce a remora of blood in them.

The bleeding, that takes place in this way, is considered by Dr. Thomson* as “an effort of nature to relieve this condition, inasmuch as it unloads the distended vessels; and when this occurs, the plethora being reduced, the hemorrhage generally spontaneously ceases.” Of these fancied ‘efforts of nature’ I have already spoken (p. 14;) and this has no more foundation. The fulness of vessels, as we have seen, gives occasion to a physical transudation from within to without, and as this transudation removes the cause, the effect—the hemorrhage—necessarily ceases.

In the passive state of hemorrhage, where we have loosened

* ‘Op. citat.’ ii. 84.

cohesion of parts, often combined with anæmia, or with a blood poor in fibrine and red particles, and rich in serum—as in scurvy, and in some of those hemorrhages, that supervene, in the worst cases of typhus and other diseases of prostration,—the use of tonics and astringents is absolutely needed; and if the latter can be brought into contact with the vessels exhaling the fluid, they occasion a condensation and corrugation of their parietes, so as to render transudation less easy. They are, indeed, the chief resource of the physician. The mineral acids, when added to blood out of the body, coagulate its albumen, and it is probable that they exert an analogous action, when taken as medicinal agents, in the cases we are considering. Their efficacy—as well as that of creosote—in scurvy, and passive hemorrhage of every kind, may be greatly owing to their increasing the tendency of the blood to coagulation.

Epistaxis is one of the most common varieties of hemorrhage. Generally, it occurs in youth, and is of no consequence. There are but few individuals, about the age of puberty, who are not more or less subject to it. In such cases, it is usually an active hemorrhage, and does not require the use of astringents. In the evolutions, that occur at puberty, and sometime afterwards, irregular hyperæmic determinations are apt to supervene, and, as the vessels of the schneiderian membrane are but loosely protected by the parts in which they creep, and therefore yield more readily to any distending force, diapedesis easily takes place through them. The system of medication is here sufficiently simple. If the hemorrhage should recur repeatedly, and not be excessive, the depletion and the revulsion, excited by a dose of the sulphate of magnesia, are often enough to rectify the evil; or if it should not yield to these, it frequently will to a repetition of the remedy, with the employment of a dry and spare diet. I say a *dry* diet, because if much fluid be permitted, either in cases of hemorrhage, or where abstraction of blood is recommended for the removal of disease; owing to the vessels being deprived of their usual quantity of circulatory fluid, the activity of absorption is largely augmented, and the drink passes rapidly through the coats of the vessels, to make up for the loss sustained by the accidental or artificial hemorrhage. In this way, the same quantity of fluid may soon be present in the vessels; but this fluid must necessarily be more tenuous—less rich in fibrine and in globules—and the consequence is, that it soaks through the vessels, by transudation or diapedesis, more readily than it did in the first instance; and thus a foundation is laid for future recurrence of the

hemorrhage. This abstinence from drinks is one of the most important practical precepts that can be inculcated in the management of the different hemorrhages.

If the hemorrhage from the nose should be so profuse, at any one time—or if it should recur so frequently—as to bring on signs of hypæmia or inanition, it becomes the duty of the physician to invoke the class of remedial agents, whose properties we are considering.

It is a common custom to apply cold water to the nape of the neck, or a piece of cold iron—as a key—and this simple agency often arrests the flow of blood from the schneiderian membrane. This effect is probably induced by the impression, made on the nerves, occasioning a diversion of the blood from the vessels of the membrane, and a similar agency may perhaps be excited, where mental impressions prove hæmostatic;—as in the case of charms, invoked in such cases, in antiquity more especially, and not wholly abandoned at the present day. The impression on those vessels can, of course, be only of a sympathetic character. In cases of anæmic hemorrhages, however, more direct applications become necessary, and recourse is had to the metallic astringent salts, to alum, dilute sulphuric acid, and to plugging the anterior or posterior nares,—the former, or both, as the urgency of the case may require. In this way, both chemical and mechanical styptics are brought to bear; the former coming in contact with the vessels whence the flow of blood proceeds; and the latter preventing the escape of the blood by the anterior or posterior outlets of the nostrils, and thus favoring the formation of a coagulum around the bleeding vessel. Dr. Thomson recommends the use of internal astringents, “as the infusion of roses(!), or of kino, or some other of the astringent vegetable substances, acidulated with diluted sulphuric acid,”* but we cannot expect much benefit from the action of substances on parts at such a distance from the seat of the malady. This, too, is the reason, why astringents are of less efficacy in hæmoptysis or hemorrhage from the lungs, which may take place from rupture or from diapedesis, but generally from the latter. Like all the other hemorrhages, too, it may be active or passive; but it is not very common to meet with the latter variety, unless we regard as such the diapedesis, that occurs, when the lungs are filled with tubercles, which is the most dangerous kind of hemorrhage from the lungs, inasmuch as its prognosis merges in that of pulmonary

* Op. cit. ii. 85.

consumption, of which it is, in this way, a symptom. The existence of tubercles interferes with the due circulation of the blood of the pulmonary and bronchial arteries. The consequence is, that on the application of a slight exciting cause—as any unusual bodily or pulmonary exertion—a vessel gives way, or the blood soaks through its coats.

The active hemorrhage, which takes place from the lungs, of a person of sound constitution,—in no wise predisposed to phthisis,—is by no means of the dangerous tendency usually conceived. An accidental circumstance may give occasion to the hemorrhage, which may be removed by appropriate measures, and may never recur.

Whenever hæmoptysis is attended with symptoms of vascular fulness or activity, indirect astringents are chiefly had recourse to—as bloodletting, and the agents belonging to the classes of sedatives, and refrigerants. But little reliance is placed upon any of the articles of the materia medica, which are regarded as direct astringents; for the simple reason, that none of them can be made to come into direct contact, except in a very diluted state, with the vessels that are exhaling blood. There are obviously only two ways in which such articles can act: the one is by sympathetic influence on the affected vessels, through the astringent agency exerted on the stomach; and the other by the astringent getting into the bloodvessels, and proceeding, commingled with the circulatory fluid, through the pulmonary artery to the lungs, or through the ramifications of the bronchial artery, if the flow proceeds from the latter vessel. In neither of these ways, could any energetic action of medication be exerted, and hence it is, that the scientific physician trusts to general principles in the management of the case; combating it by the agents already referred to, and by a proper attention to the antiphlogistic regimen generally.

Usually, when an individual is attacked with hæmoptysis, the greatest alarm is felt, and, in all cases, it is expected, that the practitioner should have recourse to bloodletting to arrest the flow. Such is the opinion of the vulgar, and occasionally it is that of the professional attendant also. This is not, however, philosophy. Every one, who has had an opportunity of seeing many cases of hæmoptysis, is aware, that the flow of blood may be arrested, at a less expense of fluid, when due attention is paid to ventilation and to posture, than when the lancet is used. A coagulum soon forms around the ruptured or transuding vessel, and the hemorrhage ceases. Whether bloodletting has to be

practised must depend upon other grounds:—upon an inquiry as to the state of the circulation, general and capillary, connected with the hemorrhage; and if there should be signs of polyæmia, or of hyperæmia, it ought to be unhesitatingly practised, otherwise the hemorrhage may recur;—taking care—as has been remarked of all cases of hemorrhage—not to allow too much fluid to be drunk, but rather advising a small piece of ice to be taken into the mouth occasionally, for the purpose of allaying thirst, and excitement. I am satisfied, too, that the repeated abstraction of blood, when there is no asthenic condition present, may lay the foundation for asthenic hyperæmia in the lungs, as it does in other organs; and this hyperæmia will be more apt, under such circumstances, to affect the lungs, from their being, owing to a previous attack, predisposed to that pathological condition.

Where hæmoptysis is produced by the presence of tubercles in the lungs, it is, as I have already said, of unfavorable prognosis, because it is one of the precursors or concomitants of phthisis. Such cases can, of course, only be palliated, by an attention to the general symptoms, and by the appropriate use of sedative and refrigerant remedies. Astringents cannot here be employed with well founded expectation of success. Occasionally, too, hemorrhage from the lungs supervenes in a more advanced stage of phthisis, owing to the giving way of a vessel in the parietes of cavities in the lungs. I have recently attended a case, in which the individual was choked by the quantity suddenly discharged in this manner. At other times, in this disease, as well as in some of the more active inflammations of the pulmonary organs, especially in children, a copious effusion of blood suddenly takes place into the lungs, so as to completely prevent the air from reaching the pulmonary vessels, and the individual dies, owing to the pulmonary apoplexy, thus induced, occasioning asphyxia, or, in other words, completely preventing the requisite aeration of the blood in those organs.

Where the blood is exhaled from the vessels of the stomach, constituting hæmatemesis, astringents can be employed with more advantage, because they come into contact with the vessels whence the hemorrhage proceeds. Here, however, it is of importance to inquire, whether the exhalation of blood may not be dependent upon obstructed circulation—on mechanical hyperæmia—in some other organ; and if so, attention must be paid to the idiopathic derangement. I have, at this moment, under care, a patient, who is affected with hæmatemesis and

dropsy of the lower belly, from what is termed an aguecake of the left spleen. This is an induration of the spleen produced by residence in a malarious locality; and as a large quantity of blood is sent to the spleen, this state of the viscus prevents the free circulation of blood through it: the consequence is turgescence of vessels, giving occasion to the transudation of the watery portion into the cavity of the abdomen so as to produce ascites; and an engorgement of the vessels of the neighboring organ—the stomach—ending in hemorrhage by diapedesis.

It is not, however, the organs in the vicinity of any infarcted or indurated viscus, that are alone liable to be the seat of hemorrhage. If the circulation be impeded in any viscus, foundation is laid for irregularity of circulation, and under this irregularity, vessels may give way, or admit of transudation in parts, that are at a considerable distance from the organ, whose diseased condition is the cause of the phenomena. Thus, epistaxis is often symptomatic of visceral infarction; and the same hemorrhage, or hæmoptysis, or hæmatemesis may be established where the uterine functions are not properly accomplished.

The same remarks are applicable to hemorrhagic discharges from the intestinal canal, constituting one of the forms of *melæna*. The lower the seat of the hemorrhage may be, the more mixed is the astringent before it reaches the diseased part, and, consequently, the less efficacious. Generally, in ordinary cases, of both hæmatemesis and *melæna*, I have found a combination of sulphuric acid with one of the alkaline or earthy sulphates, forming a supersulphate, to be well adapted for fulfilling every object of the astringent medication, where this is demanded; or the metallic or other astringents may be used, under the general precautions previously inculcated.

In cases of what are termed 'open hemorrhoids,' or of hemorrhage from the rectum, the astringent remedies when indicated, may be made to come into immediate contact with the seat of the hemorrhage by injection. The use of gently astringent or stimulating lotions and of laxatives, to prevent irritation from indurated fæces, is, in such cases, more beneficial than any other mode of treatment. Occasionally it happens, that the hemorrhage is so alarmingly profuse as to require the employment of the most powerful astringents,—of the mineral or vegetable kingdoms. These, however, should never be used of such strength as to condense and corrugate the parts, so much as to endanger the supervention of inflammation.

Hæmaturia—or hemorrhage from the urinary organs—is a va-

riety not directly under the control of astringents. No substance of this class can come in contact with the seat of the mischief, until it has passed into the mass of blood, and been separated at the kidneys. How small, consequently, must be the quantity of the astringent, taken into the stomach, which can act at any one time upon the exhaling surface affected with hemorrhage. The best mode of managing such cases is to treat them on general principles;—by perfect quietude; avoiding all irritation; and, if there be excitement, reducing the quantity of the circulating fluid; but if, on the other hand, there be want of tone, administering substances belonging to the class of tonics, or of excitants proper. I do not know, that, in these cases, I have observed any very marked advantage from the use of astringents, except from their tonic agency. Improvement has occasionally followed the employment of some of the metallic and vegetable astringents, but it has been produced, apparently, by the general effect, not by any direct astringent medication having been exerted on the vessels of the urinary organs; for, even in those cases in which a mineral astringent can be detected in the urine, its quantity at any one moment in the urine distilling from the kidneys, must be too small to exert any sanative influence. Dr. Thomson, who has unbounded faith, and, I should be disposed to say, credulity on many points of therapeutics, as connected with the effect of particular medicaments, places great reliance on the use of certain astringents in hemorrhages from the urinary organs. “Hæmaturia, or bleeding from the bladder,” he says, “is generally depending upon some organic affection of the urinary organs; but in attending to the *primary disease*, much immediate advantage is derived from the use of astringents. It was in a case of this kind that Mr. Brodie administered Ruspini’s styptic with so much seeming advantage; and I have seen great benefit, in similar cases from the use of the uva ursi which appears to pass unaltered through the kidneys. Since the discovery, which I have made of the composition of Ruspini’s styptic, I am disposed to propose a combination of gallic acid with an infusion of the leaves of uva ursi, obtained by rubbing them in cold water.”* We may merely remark on this passage, that, like many other articles of the materia medica, the uva ursi has been inordinately extolled for virtues, which it by no means possesses, and already it has, in the opinion of many of its former supporters, sunk to the proper level above which it ought never to have

* Op. cit. ii. 87.

been elevated. De Haen proposed it as a remedy for calculous complaints, and for ulcerations of the urinary organs; and it is still prescribed in such cases. There are few, however, of the present day, who regard the agency it exerts to be any thing more than the tonic impression made by it on the stomach.

When metrorrhagia or uterine hemorrhage occurs in the unimpregnated state, great reliance is placed in the use of sedatives, refrigerants and astringents,—the former when the hemorrhage is active, and the latter when it is more atonic. Where astringents are indicated, the tonic medication is also required, and cases occasionally occur, where the safety of the patient depends upon the effect exerted through the general system on the vessels, that are pouring out the blood. In a former section I have referred to an instructive case of this kind.*

When astringents are demanded in metrorrhagia, they can be made to come in contact with the affected vessels by means of the stomach pump. Cold water—ice cold—is, in this way, a valuable agent as well as the solutions of sulphate of zinc or other saline astringents, and the infusions or decoctions of vegetable astringents,—as of the red oak bark, catechu, &c.—which act as styptics. The tampon is also an excellent agent, after these means have failed; by detaining the blood in the vagina, and in contact with the exhaling vessels, until it has coagulated, and thus acting as a mechanical styptic. It is an efficacious remedy in cases of hemorrhage occurring during utero-gestation.

On the management, necessary in these last cases, as well as in uterine hemorrhage occurring during, and after delivery, it is unnecessary to dwell, as it consists in manipulations appertaining to the science of obstetrics. Astringents are but rarely had recourse to, because, during utero-gestation, and prior to the delivery of the fœtus, they cannot be easily thrown up as high as the seat of the hemorrhage, and because other modes of management can be adopted, which strike more nearly at the root of the mischief.

Hemorrhage, when the placenta is not attached over the os uteri, is owing to a partial separation of the placenta from the uterus, so that the apertures in the maternal veins are no longer plugged up by the placental mass; and the only effective mode of rectifying the evil is to cause the uterus to contract around the fœtus, and thus to re-plug the apertures in those veins. This is done by discharging the liquor amnii. Where the placenta is

* See page 38.

seated over the os uteri, the hemorrhage is unavoidable—not accidental as in the case we have just described—and there is no safety to the mother or child except in speedy delivery.

Again, in hemorrhage after delivery, cold and astringent fluids might be thrown into the cavity of the uterus, but this plan is rarely had recourse to. The cause of the hemorrhage is here, also, the want of contraction of the uterus, and the means, found most efficacious, are—if the case be urgent—to introduce the hand into the interior of the organ; to irritate its inner surface with the fingers, and to press, at the same time, on the abdomen. The uterus will generally contract, so as to force the hand out of it; and in ninety-nine cases in the hundred, when the organ can be felt in the hypogastric region, contracted to the size of the foetal head, the woman may, under ordinary precautions, be deemed free from all danger of recurrence. At times, the hemorrhage has returned under these very circumstances, but the instances are rare. When the case is not so urgent, simple pressure on the abdomen over the region of the uterus will be generally sufficient.

In most cases of hemorrhage after delivery, the flow of blood is so profuse, that there is no opportunity for employing any astringent solution or infusion; but, in the more protracted and less alarming varieties, the aid of these agents may be invoked with much prospect of advantage. They can only be regarded, however, as adjuvants. The means of primary importance are those obstetrical *manœuvres*, to which I have alluded.

The use, then, of astringents in the different forms of hemorrhage, can be easily understood. In none of the active kinds can they be indicated, and, in the passive varieties, great reliance can only be reposed on them, when they can be made to come into direct contact with the vessels, that are discharging their blood,—whether by rapture or by transudation.

From the general principles, that have been laid down, it can never happen, that the employment of astringents can be looked upon as advisable, in any of the more acute varieties of those inflammations of the alimentary tube, that are accompanied by discharges. Accordingly, in inflammation of the lining membrane of the small intestines—characterized by pain in the abdomen,—on pressure, or without it; redness of the tongue; and repeated bloody or slimy discharges; as well as in the same inflammation, when seated in the large intestines, and constituting dysentery,—astringents, during the first and active period of the disease,

are to be avoided; but when the complaint has persisted for a time, notwithstanding the general antiphlogistic medication and regimen, and the constant use of small doses of castor oil to remove all offensive secretions from the tube, gentle astringents may—as we have seen of excitants—be employed with much prospect of advantage. In very urgent cases, it may even be necessary to have recourse to the more powerful, administered both by the mouth and the rectum; and their agency may be augmented by the addition of opium to allay the irritability of the canal, which the state of erethism of the mucous membrane so largely developes. Of the vegetable astringents, employed for this purpose, the catechu, and the kino are the most common. Of the mineral,—alum, the dilute sulphuric acid, &c.; and, if these fail, no plan can be adopted with better expectation of success than that of completely changing the whole of the physical circumstances surrounding the individual; by travelling exercise, which, at times, removes these chronic affections of the mucous membranes, after the best directed endeavours of the physician have been assiduously, but vainly, exerted.

The same principles apply to the management of diarrhœa, which is caused by a degree of erethism of the mucous membrane, generally produced by extraneous substances taken by the mouth, and irritating the lining membrane of the intestines. Astringents are here, in the first instance, improper. The cause of the mischief must be first removed by gentle evacuants,—as the *oleum ricini*,—and it is not unless the discharges should be inordinately frequent, and colliquative, that attempts should be made to check them by astringents. At different periods of medical history, diarrhœa has been viewed in opposite aspects,—at times, as an effort of nature to get rid of morbid matter, and, therefore not to be interfered with; and, at others, as always injurious, tending to debility and death, and consequently to be arrested as speedily as possible. Both exclusive views are objectionable. The cause of the mischief must be inquired into, and if possible removed; and, let it be borne in mind, that an increased number of evacuations may take place in consequence of the retention of indurated fecal matter in some portion of the intestinal tube;—the irritation, excited by its presence, inducing augmented exhalation from the lining membrane, and stimulating the muscular coat by contiguous sympathy, so as to increase the natural peristole of the intestines beyond the due bounds. Diarrhœa, may be, in this manner, a symptom of constipation, and

it is not until this state of fecal retention is removed, that a cure can be effected. In the cases of diarrhœa, which occur in phthisis pulmonalis towards its close, and which are occasioned by inflammation of the lining membrane of the ileum and colon more especially, we can employ only palliatives. The diarrhœa is but a symptom of the hectic, and whatever remedies are used, we cannot calculate on any important advantage from them. It is usual to exhibit an opiate, which has the effect of allaying the irritation in some degree; and, occasionally, the *mistura cretæ* of the pharmacopœias is made the constituent of the prescription; or the infusion of catechu or kino, or some other vegetable astringent; but, for the reasons just mentioned, no calculation of positive, permanent benefit can be founded on their administration.

Simplicity in the formation of prescriptions, is highly important; in order that we may be able, in all instances, to trace the effects of particular remedial agents in particular states of disease. The practitioner is often in the habit of combining remedies, taken from different classes of medicinal substances, and *experience* will often lead him to ascribe virtues to the combination, which are perhaps ascribable to one ingredient of the prescription only. Dr. Thomson gives us a signal instance of this kind. Dr. Fordyce thought he had improved the practice in diarrhœa by combining astringents with diaphoretics, and he recommended a combination of ipecacuanha and tormentilla. "We now know, that no effect could be ascribed to the ipecacuanha in this combination, as an inert tannate of emetina is formed; and, consequently, that the whole of the benefit must have resulted from the tormentil, which is indeed an excellent astringent in this disease."*

In that specific inflammation of mucous membranes, which constitutes gonorrhœa virulenta, much difference of opinion has existed regarding the employment of astringents. When they are used at all, it is in the way of injection; and, whilst they are employed from the first by some practitioners, they are altogether discarded by others,—on the ground, that they are apt to induce stricture, or orchitis. I do not think there is much, if any, foundation for these fears. When such affections do supervene, it is generally owing to the lesions produced by the protraction and extension of the inflammation; and the practitioner

* Op. cit. ii. 90.

ought not to hesitate to put an end to the specific inflammation at once, by an astringent or any other mode of medication, which is capable of accomplishing the object. What has been said of the use of excitants and astringents, in inflammations of the mucous membranes in general, applies here; and the same difficulty exists in knowing whether the overdistended state of extreme capillary, or the excited state of the vessel communicating with it, predominates. When, however, the inflammatory signs are high; the extremity of the urethra tumid and painful; and chordee is urgent; the general antiphlogistic treatment had best be confided in, and astringent injections be postponed until these signs have been got under. When injections are had recourse to in gonorrhœa, the metallic astringents,—as the sulphate of zinc, the acetate of zinc, the binacetate of lead, the sulphate of copper, the sulphate of alumina and potassa, and the nitrate of silver are usually selected.

But whatever hesitancy may exist, regarding the use of astringents in the early stages of gonorrhœa, none need be entertained when the inflammatory symptoms have almost wholly disappeared, and a state of gleet alone remains. Here, not only astringents, but excitants are needed; and the bougie will often remove the disease when every kind of injection has failed. This is partly owing to the instrument coming in contact with the seat of the discharge, however high up it may be in the urethra, which cannot easily be effected by injections;—at least, cannot be effected in the ordinary mode of throwing them up by means of a syringe. They may, however, be directed to any part by means of a canula,—as an ordinary silver or elastic gum catheter,—which may be passed up until it has nearly reached the seat of the disease, and the fluid of the injections be propelled through it.

Similar remarks apply to the use of astringent injections, in leucorrhœa. I say ‘injections,’ because but little faith can be placed in the administration of astringents by the mouth, for reasons applicable to hemorrhages from other parts than the alimentary tube,—namely, that the astringent must enter the mass of blood, and can, of course, reach the mucous membrane of the vagina in a state of extreme dilution and admixture only.

Leucorrhœa—like other inflammations of mucous membranes—is, in some cases, more highly inflammatory than in others. It may require the use of powerful antiphlogistics in one case; whilst in another the astringent medication may be advisable. At times, it is accompanied by considerable remora of fluids in

the membrane, and by much relaxation of parts, and it is in these cases chiefly, that the use of mineral astringents, and of the astringent vegetable infusions and decoctions is invoked. Where the inflammation and irritation are excessive, soothing topical remedies,—as warm milk and water; flax seed tea, &c.,—are rather indicated; or, if cold and astringent lotions afford more relief, care must be taken not to render the astringency too marked. In such cases, the solutions of the metallic salts, used in inflammation of the mucous membrane of the urethra, are generally chosen; but where the atony and relaxation above mentioned exist to any great extent, infusions or decoctions of catechu, or of red oak bark or tormentilla, or of some other vegetable astringent are generally selected.

In every case, care must be taken not to make the lotion too astringent; otherwise, as we have before seen, the inflammation may be augmented.

In that singular disease of the functions of nutrition—diabetes mellitus—characterized by an unusual discharge of sweet urine,—the vegetable and mineral astringents—in the ignorance, that prevailed of its pathology—were at one time universally prescribed, but without any benefit. The disease does not consist simply of a profuse secretion of urine. This is the smallest part of the evil. It is the formation of saccharine matter at the expense of the system, which is the main source of mischief, and this obviously cannot be affected by the use of astringents.

Immoderate sweating—technically termed ‘ephidrosis’—is rather an unpleasant symptom of certain morbid conditions of the system, than a disease itself. One or two singular epidemics, of which this ephidrosis was a prominent symptom, have occurred from time to time in Europe. The *Sudor Anglicus* or ‘sweating sickness,’ was a very severe epidemic disease, which appeared in England, in 1486, and recurred at different times until about the middle of the 16th century. It was accompanied by coldness; excessive prostration of strength; palpitation; frequency and irregularity of pulse; and generally terminated favourably or unfavourably in the course of twenty-four hours.

The *Suette de Picardie*, is another epidemic malady, which has appeared several times in the province of Picardy in France. The principal symptoms were profuse sweats, accompanied by a miliary eruption. The disease recurred in 1821, and has been

described at length by M. Rayer, in a work, which he did me the honour to transmit to me.* He considers the *Suette miliaire* of 1821 to consist of a simultaneous state of inflammation of various tissues; and proposes to class it with variola, rubeola, and scarlatina.

In these two epidemics the state of the system appears to have been essentially different. Increased exhalation from the cutaneous surface may, indeed, take place in two opposite conditions of the vascular system. In the one, the vital forces may be exalted; in the other, depressed; and hence the warm, genial perspiration of health, induced by exercise or by excitants of any kind; and the cold, clammy exudation, which is the precursor of dissolution.

In confirmed phthisis, the colliquative sweating is one of the accompaniments of the hectic fever, and cannot of course be removed, unless the condition of the lungs, which gives rise to the hectic, can be rectified. As this is impossible, no signal advantage can be derived from the employment of astringents, although we are, at times, disposed to attempt to palliate an evil—which we cannot remove or prevent—in consequence of the complaints of the sufferer. There is nothing better adapted for this end, than a combination of the tincture of opium, and dilute sulphuric acid, or the *acidum sulphuricum aromaticum*.

Again, in all relaxations of parts, with which astringent solutions can be made to come into immediate contact, they are the remedial agents, that are clearly indicated; hence, they are employed in *procidencia ani*, and *procidencia vaginæ*, with the best effects;—these pathological conditions being usually dependant upon a state of atony of the parts concerned.

Lastly, the surgeon has recourse to them in many of the *morbi externi*, that fall under his province. Of their use in ophthalmia, aphthæ, and in erysipelatous and phlegmonous inflammations, I have already spoken; and of the particular morbid states, in which their employment seems to be indicated. In chronic ulcers of an indolent character, they are used, like excitants, to induce a new action in the ulcerated surface, and are often beneficial. As styptics—chemical as well as mechanical—they are likewise employed, where the hemorrhage is insufficient to de-

*Histoire de l'Epidémie de Suette miliaire qui a regné en 1821, &c., par P. Rayer. Paris, 1822.

mand the use of the ligature, or where the ligature cannot be easily applied.

Of late years, a styptic has been re-introduced into notice in Italy, which astonished the surgical world for a time, but whose operation—like that of many agents equally strongly recommended—has been found to far exceed its powers. I allude to the “new hæmostatic,” as it was termed—the *Acqua Binelli*—so called, after Dr. Fidele Binelli—the inventor. This liquid is perfectly transparent, almost tasteless, having a slightly empyreumatic odour, in which neither salt, earth, alkali, nor acid can be perceived by the senses. The first public trials, to test the efficacy of this liquid in arresting hemorrhage, were instituted at Turin, in 1797, by order of the government, the results of which were regarded favorable. Soon after this, Binelli died, and the secret for making the preparation is said to have died with him; but in the years 1829 and 1830, the successors of Binelli affirmed, that they had discovered the secret, and fresh experiments were instituted, and repeated in Germany. Various bloodvessels were divided in animals,—the femoral and carotid arteries; the internal jugular veins; and the cuts were made in every direction;—some longitudinally; some obliquely; others completely across; and in all cases the hemorrhage yielded as soon as charpie or lint, steeped in the *Acqua Binelli*, was applied and pressed gently against the wound for five or ten minutes.

Encouraged by the results of the experiments on animals, its effects were tried on man. *First*. Before the assembled class in Berlin, in the operating theatre, after amputation of a finger, the arteries of which emitted blood very freely. *Secondly*. In the case of a wound of the hand, caused by a cutting instrument, which entered deep between the metatarsal bones of the thumb and index finger, and in which the hemorrhage could not be arrested by compression or the tourniquet, without fear of causing gangrene. *Thirdly*. After the amputation of an indurated inguinal gland, accompanied by hemorrhage; and, *fourthly*, after amputation of the thigh on account of a scrophulous knee joint, when the blood issued with great force—on the least relaxation of the tourniquet—from the crural, perforating, and other muscular arteries, as well as from the veins. In all these cases, the hemorrhage was speedily and permanently arrested, by the application of the *Acqua Binelli* without any other aid. It did not cause the least pain on its application, nor did it produce any discoloration on the surface of the wound; or eschar, or any other local or general effect of a disagreeable character.*

* ‘American Journal of the Medical Sciences,’ for August, 1833, p. 537.

Such effects would appear to be most strikingly ascribable to the causes assigned, notwithstanding the apparent inertness of the fluid, as tested by the senses. The following observations of Dr. John Davy prove, however, that the boasted *Acqua Binelli* is only another example of the numerous remedial agents, which have given occasion to inferences not confirmed by farther investigations. They completely overthrow the fancied hæmostatic powers, ascribed to the liquid by the German and Italian experimenters.

“I first examined into its physical and chemical qualities. It proved of the same specific gravity nearly as distilled water. It was neither acid, alkaline, nor saline. Its odour was not unlike that of coal-gas not purified, which is lost by boiling. Its taste was rather pungent, not in the slightest degree astringent; in brief, it appeared to be merely water, containing a little volatile oil or naphtha, and was probably prepared by the distillation of water from petroleum, or some kind of tar.

“I next made trial of it as a styptic. I scratched the back of the hand with a lancet till the blood flowed. The water applied to the scratch rather increased the bleeding than stopt it. The following morning, in shaving, the razor inflicted a slight cut: the *Acqua Binelli* was again applied, and the result was the same.

“These few and simple trials were made in January, 1831, just after I received the water; and they of course convinced me that the thing was an imposition on the public, and deserving of no further investigation.

“A short time since my attention was recalled to the subject by a medical practitioner of this island, who had studied at Naples, inviting me with others to witness the effects of a preparation made in imitation of the *Acqua Binelli*, and which he maintained was identical with it in composition and virtues.

“The experiment he invited us to witness appeared an unobjectionable one, namely, the partial division of the carotid artery of a goat, the bleeding of which he undertook to stop by means of his fluid. He allowed us to expose the vessel and cut it across; about one-half of the circumference of the artery was divided, and the bleeding was most profuse. He stood ready with compresses moistened with the fluid, which he instantly applied one over the other, and secured them by rolling a bandage about the neck, making moderate pressure on the wounded vessel. A little oozing of blood followed, which soon ceased. He said

that in three hours the bandage and compresses might be removed, without any renewal of the hæmorrhage. Accordingly, at the end of three hours they were removed; but when the last compress was raised, the bleeding broke out as furiously as at first, and, to save the life of the animal, the artery was secured by ligature. On examining the last compress, a small coagulum of blood was found adhering to it, just the size proper to close the wound in the carotid; thus accounting for the ceasing and renewal of the bleeding.

“Reflecting on this result, and considering the chemical nature of the fluid employed to moisten the compresses, which appeared analogous to that of *Binelli*, the conclusion I arrived at was obvious, namely, that, had the compresses used been moistened merely with common water, the effect would have been the same,—the bleeding would have been stopt; and it also appeared very probable, that, had the compresses been allowed to remain undisturbed, there would have been no renewal of the bleeding.

“To ascertain the truth of these inferences, the following experiments were made.

“On the same day, February 8th, in the presence of several medical officers, I divided partially, transversely, the carotid artery of two dogs; one small and feeble, the other of moderate size and strong. In each instance, the bleeding was most profuse till compresses dipt in common water had been applied and secured by a bandage, which, as in the case of the goat already given, completely stopt the hæmorrhage.

“The small dog, from the proportionally large quantity of blood which it lost, was very feeble immediately, and appeared to be dying; but it presently rallied, and for several days seemed to be doing well. It unexpectedly died on the 15th, seven days after the infliction of the wound. The bandage during this time had not been touched, and no application had been made. Now, on exposing the neck, the wound was found covered with coagulable lymph discharging pus; and, on dissecting out the artery and eighth nerve contiguous to it, a mass of coagulable lymph appeared lying over the wound in the vessel, extending about half an inch above and below it. This mass of coagulable lymph having been carefully removed, and the artery slit open, the vessel was found quite pervious,—not in the least contracted. The wound in the fibro-cellular tissue, or external coat, was closed by a minute portion of dense coagulable lymph.

But not so in the middle and inner coat; in these there was a gaping aperture, across which, on minute inspection, two fine threads, apparently of coagulable lymph, (as if the commencement of the healing process,) were observable. The cause of the dog's death was not discovered.

“The other dog did not appear to suffer from the wound. The bandage and compresses were removed on the 15th February without the occurrence of any bleeding. On the 20th of the same month, the wound in the neck was nearly closed by granulations. The artery was now exposed by incision; and the portion that had been wounded taken out, between two ligatures previously applied. On careful examination of this excised part, it was found free from coagulable lymph, at least there was not the same thickening or tumour from lymph deposited, as in the former case; it was probably absorbed. When the external loose cellular tissue was dissected away, a very minute elevation, about the size of a pin's head, appeared on the site of the wound, the remains of the cicatrix externally. The artery was completely pervious, and not at all contracted where it had been wounded. Slit open for internal examination, the wound in the inner coat was marked by a red line interrupted by two white spots; there was no gaping; the edges adhered together, excepting at one point; elsewhere the union was complete. The white spots resembled the natural lining membrane; and had the whole wound been similarly healed, I believe it would have been impossible to have traced it.

“The general results of these experiments, (if I may be allowed to speak so of so small a number,) are not without interest in application to surgery. They show how a hæmorrhage from the wound of a large artery, which by itself would be speedily fatal, may be easily arrested by moderate compression through the means merely of several folds of linen or cotton moistened with water; and they further show how, under this moderate compression, the wound in the artery heals, the vessel remains pervious, and without the formation of an aneurism; and how, after a time, only slight traces of the wound are discoverable. Under this moderate pressure the healing of the wounded artery seems to be very analogous to that of a wounded vein, and apparently by means of the same natural process.

“Whether similar results could be obtained, were trial made of the same means in the wounds of arteries in the human subject, can only be ascertained positively by judicious experiments. —The probability is, that the results would be the same. The

analogy is very complete, and some facts well known in surgery accord with it, not to mention the experience of the effects of the *Acqua Binelli*, as certified by men of high respectability.

“It was my intention to have given a selection of the certified cases in favor of the *Acqua Binelli*, brought forward in the pamphlet which is furnished with the water. But on reconsidering them, it appeared a superfluous labour, as the results, (giving them credit for correctness,) however excellent in a curative point of view, are no more than the enlightened surgeon of the present time may readily admit to be owing to water dressings alone, without the aid of pressure,—the majority of instances adduced being examples of gun-shot wounds and contused wounds, from which there was no profuse bleeding, and no necessity, according to the ordinary mode of surgical treatment, for securing wounded vessels.

“I have laid stress on the effect of the *pressure* afforded by the wet compresses applied in the experiments related, believing that the virtue of the means consists in the pressure,—of course not in the water, excepting so far as it renders the compresses better fitted for adaptation to the wound to produce the degree of resistance requisite to counteract the heart’s impulse in the vessel;—and also better fitted to exclude atmospheric air. I would also lay stress on the *moderate* degree of pressure that is produced in the manner described,—allowing the blood to pass through the canal of the artery, and, as before observed, doing little more than resisting the momentum of the blood in its passage from the moving source.

“The importance of this moderate degree of pressure, which has the effect of reducing as much as possible the wounded artery to the condition of a wounded vein, is, if I do not deceive myself, very considerable. When I have pressed with the fingers forcibly on the compresses applied to the wound, expecting at the moment to arrest the bleeding, I have been disappointed. The hæmorrhage has continued; and it only ceased when the compresses have been secured, and not tightly, by a roller passed around the neck of the animal. And, further in illustration, I may remark, that I have been equally disappointed in using graduated compresses, insuring considerable pressure on the wound. This means has failed, when general moderate pressure, effected by compresses about two inches long and one wide, succeeded.

“On considering the comparative circumstances of these two modes of applying compression, therefore, the difference of result is perhaps what might be expected. The severe pressure

can hardly arrest the bleeding except by pressing the sides of the vessel together and closing the canal, the accomplishment of which requires a most nice adaptation, and a force which cannot easily be applied with steadiness except by mechanical means, and in situations affording firm support beneath.

“Should the expectation which I have ventured to form of this method of stopping the bleeding of wounded arteries of a large size in man be realized on trial, I need not point out how very useful it may prove in military surgery,—how very available it will be in the field and in battle, especially in great actions, when, however numerous and well-appointed the medical staff of an army, the number of wounds requiring attention must always exceed the means of affording adequate surgical relief, according to the plan of treating them at present in use, of suppressing hæmorrhage by ligature.

“I have said nothing of the boasted efficacy of the *Acqua Binelli* given internally. I trust it is as little necessary to make any comments on it now-a-days, as on the tar-water of Bishop Berkley, so very analogous in nature and reputation. Both the one and the other in some cases may be serviceable; but their principal recommendation appears to be, that in doubtful cases they are innocent.”*

I have given Dr. Davy’s observations at some length; because they contain interesting information, both as regards the physiology, pathology, and therapeutics of wounded vessels, and convey a useful lesson to the inquirer,—not to deduce inferences from inadequate data, without having investigated every collateral circumstance that bears upon the question. Were this course pursued, we should not have as many examples of the *experientia falsa* as we are daily doomed to witness. It has been suggested, that the *Acqua Binelli* may be indebted for its fancied hæmostatic property to creosote in some form; but Dr. Davy’s explanation appears all sufficient to account for the phenomena.

Such is a general view of the *modus operandi* of astringents in the principal diseased conditions of the frame. When properly employed, they are by no means the least useful of our medicinal agents.

* ‘*Edinburgh Medical and Surgical Journal*,’ for July, 1833; and ‘*American Journal of the Medical Sciences*,’ for Nov. 1833, p. 252.

TABLE

OF THE CHIEF ASTRINGENTS, AND THEIR OFFICINAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Acidum sulphuricum aromaticum. <i>Elixir of Vitriol.</i> (See Table of Tonics.)	}	m 10 to 30.
Acidum sulphuricum dilutum. <i>Dilute Sulphuric acid.</i> (See Table of Tonics.)		.....	{ m 10 to 30. Also applied locally, properly diluted.
Alumen, <i>Alum.</i> (The sulphate of alumina and potassa.)	}	gr. 10 to 30.
		Alumen exsiccatum, <i>Dried alum.</i> (Alum from which the water of crystallization is driven off by heat.	} gr. 5 to 15.
		Liquor aluminis compositus, <i>Bates's Alum water.</i> (Alum.; zinci. sulph. ana $\frac{1}{2}$ oz.; aq. bullient O $\frac{1}{2}$.)	} A powerfully astringent wash.
Argenti Nitras. <i>Nitrate of silver.</i> (See Table of Tonics.)	}	{ gr. $\frac{1}{4}$, gradually to 4 or 5.
Catechu. <i>Catechu.</i> (The extract of the <i>Acacia catechu</i> .)	}	From Hindusthan.	gr. 10 to dr. $\frac{1}{2}$.
		Infusum Catechu compositum. (Catech. dr. $2\frac{1}{2}$; cinnam. dr. $\frac{1}{2}$ aq. bullient O $\frac{1}{4}$.)	} f. oz. $1\frac{1}{2}$ to f. oz. 3.
		Tinctura Catechu. (Catech. oz. 3; cinnam. cont. oz. 2; alcohol. d. lut. O 2.)	} f. $\frac{1}{2}$ dr. to f. dr. 3.
Cupri Sulphas. <i>Sulphate of Copper.</i> (See Table of Tonics.)	}	{ gr. $\frac{1}{4}$, gradually to gr. 2.
		Solutio Sulphatis Cupri composita. (Cupri Sulphat.; alum.; ana oz. 3; aq. O 2; acid sulph. oz. $1\frac{1}{2}$.)	} an external styptic.
Ferri Muriatis Tinctura. <i>Tincture of Muriate of Iron.</i> (See Table of Tonics.)	}	m 10 to 30.
Ferri Sulphas. <i>Sulphate of Iron.</i> (See Table of Tonics.)	}	{ gr. 1 to 5. Used also in solution as an external styptic.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Gallæ. <i>Galls.</i> (An excrescence on the leaves of the <i>Quercus Infectoria</i> , produced by the puncture of an insect—the <i>Cynips Quereus folii</i> , or <i>Dioplepsis Gallæ tinctoria</i> .)	From Syria and Asia Minor.	} Unguentum Gallæ. (Pulv. gallar. oz. 1; adipis oz. 7.) }	gr. 10 to 20.
Hæmatoxyton. <i>Logwood.</i> (The wood of the <i>Hæmatoxyton Campechianum</i> .)	From tropical America.	} Decoctum Hæmatoxyli. (Hæmatoxyl. ras. oz. 1; aq. O ij.; boil to O l.) } Extractum Hæmatoxyli. (The watery extract.) }	gr. 20 to dr. 1. } f. oz. 1½ to f. oz. 3. gr. 10 to 30.
Kino. <i>Kino.</i> (The extract of the <i>Nauclea Gambir</i> of India, and the <i>Pterocarpus crinacea</i> of Senegal.)	From India and Africa.	} Pulvis Kino compositus. (Kino dr. 15; cinnam. oz. ½; opii dr. 1.) } Tinctura Kino. (Pulv. kino oz. 3; sp. rect. O ij.) }	gr. 10 to 30. } gr. 5 to 20. } f. 1 dr. to f. 3. dr.
Krameria. <i>Rhatany.</i> (The root of the <i>Krameria Triandra</i> .)	From S. America.	.....	gr. 20 to 30.
Liquor Calcis. <i>Lime Water.</i>	From calc. recent. oz. 4; aq. distill. cong.	} }	f. oz. 2 to ½ O } gr. 1 to 10.
Plumbi Acetas. <i>Acetate of Lead.</i> <i>Sugar of Lead.</i>	{ By exposing lead to distilled vinegar and evaporating the solution. } }	} }	} } Used also externally as a lotion, when dissolved in water.
		Liquor Plumbi Subacetatis. <i>Goulard's Extract.</i> (Plumb. acet.; plumbi oxid. semi-vitr. ana oz. 8; aquæ distillat. O ij.) Liquor Plumbi Subacetatis dilutus. (Liq. plumb. Subacetat. f. dr. 1; aquæ distillat. O j.)	} Used only as an external application when diluted;—f. dr. 1 to f. oz. 1, to O j. of water.
Quercus Alba. <i>White Oak Bark.</i> Quercus Tinctoria. <i>Black Oak Bark.</i>	.....	Decoctum Quercus. (Cort. Quercus oz. 1; aq. O ij.; coque ad O j., ct cola.)	} f. oz. 1½ to f. 3 oz. } Used also as a wash.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Zinci Sulphas. Sulphate of Zinc. (See Table of Tonics.)	{ }	{ }	{ Used external- ly in solution. gr. 1 to 5, to aq. oz. 1.
Creosote.....	{ From the empyreu- matic matter, pro- duced on the distil- lation of wood—by repeated neutrali- zation and distilla- tion.	{ Usually kept in the shops in the pure state;—in <i>alcoholic solution</i> (f. dr. 1 to f. dr. 8 of alcohol,) and in <i>watery solution</i> (1 part to 80 of water.)	{ in 2 to 5 of the tincture.

SECTION V.

EMETICS.*

Definition of emetics—Physiology of vomiting—Modus operandi of emetics—Effects on the stomach, and general system—Evils of their too frequent employment—Therapeutical application of emetics—In febrile diseases—In the phlegmasiæ—In certain local affections—In hemorrhage—In dyspepsia—Jaundice—Mental alienation, &c.,—In the neuroses—Dropsy, &c.

So far, attention has been directed to the substances, which are usually looked upon as general stimulants, or those that excite the different functions of the body, although their primary operation may be made upon one part only. The agents, whose consideration we now take up, act specifically upon a part of the body, and on this so markedly, that their general operation becomes by no means prominent, and is often overlooked, although it is all important in the treatment of many morbid conditions.

Emetics have been defined agents, which, by the excitant effect they produce upon the stomach, give occasion to vomiting;† but this definition is meagre, and, as we shall see, unsatisfactory. That of Dr. Paris is to be preferred.—“Substances which excite vomiting, independently of any effect arising from the stimulus of quantity, or of that occasioned by any nauseous taste or flavour.”‡

The physiology of vomiting has, of late years more especially, engaged the attention of some of the most accurate anatomists, and physiologists of the time:—of Magendie, Maingault, Richerand, Legallois, Béclard, and others. At one time, it was universally conceived, that the stomach is the main—indeed, the

* Vomitoria, from *εμεω*, ‘I vomit.’

† Schrott.—*Taschenbuch der Arzneimittellehre*, s. 51.

‡ Paris: *Op. cit.* p. 83.

sole agent; whilst, at an after period, the opposite view was maintained, and the stomach was denied any agency in the result. The intimate consideration of this topic of physiology has been gone into, in another work;* and it is not necessary to repeat it here: I may merely observe, that the former of the theories referred to, which prevailed of old, is full of error, and ought to be discarded; and, as often happens, when exclusive and hostile views are maintained, the truth probably lies between them, or may consist of a combination of both. From a careful examination of what has been said on both sides of the question, it appears to me, that we are justified in inferring—that the stomach, of all the organs concerned, is the one whose action is least energetic and indispensable; that the pressure, exerted on the parietes of the stomach by the diaphragm, and abdominal muscles, is the most powerful cause; as it is found, that the more or less complete paralysis of the diaphragm, or the destruction of the abdominal muscles, renders vomiting much more feeble, and more slow in manifesting itself.

When an emetic has been taken into the stomach in sufficient dose, a train of phenomena make their appearance contrasting greatly with those that follow. An indescribable sensation is first of all experienced, which is chiefly referred to the region of the stomach, and consists of a feeling of anxiety and of circumgyration, which extends also to the head; a copious flow of the saliva and of sweat takes place, with paleness of the surface, and indeed, every sign of diminished nervous and vascular action. The state of 'nausea,' as it is termed, is manifestly one of debility, or of diminution of the vital powers below the healthy standard. When this state, howsoever occasioned, has continued for any length of time, it is usually succeeded by a very different condition of the functions; the diaphragm and abdominal muscles are thrown into violent contraction; an inverted action of the muscular coat of the stomach is produced; and, under these combined actions, the contents of the stomach are ejected. During this condition of excited action, the pulse assumes fresh vigor; the skin becomes florid, especially that of the face; a copious, warm perspiration takes the place of the cold, clammy sweat of nausea, and all is energy where depression previously prevailed.

It is obvious, then, that the therapeutical effects of substances, capable of exciting emesis, may vary according as they are admi-

* 'Human Physiology,' First Edit. i. 518, and Second Edit. i. 533.

nistered to keep up nausea, or given in doses sufficient to induce emesis; and, again, that emetics may differ amongst themselves according as their operation is preceded by more or less nausea.

Where the nauseant operation is alone induced, the effects of the remedy throw it under another class of medicinal agents, and, accordingly, 'nauseants' will be found, in my table of classification, and in the body of the work, amongst those agents that diminish action.

In order, that an emetic shall produce its effect upon the stomach, it must first of all affect the brain. If it irritate the nerves of the stomach, that irritation must be appreciated by the brain, and a reaction be exerted upon the stomach, before it can discharge its contents. It is not necessary, however, that the impression should be first made on the gastric nerves. Certain sources of irritation, seated elsewhere, may affect the brain by their irradiations and produce the same effect.

Various circumstances, affecting the nerves of the stomach, may excite vomiting;—for example, the administration of substances belonging to the class of emetics; overdistension of the stomach; offensive character of food; morbid secretions from the supradiaphragmatic portion of the alimentary canal or from the stomach itself; reflux of bile into the stomach, &c. &c. In these cases, the impression is made upon the nerves of the stomach; thence it passes to the brain, which appreciates the sensation, and calls upon the different organs, concerned in vomiting, to execute their functions.

But, numerous cases present themselves, in which the impression is first received on other parts than the stomach, where it equally proceeds to the brain, which then invokes the action of the appropriate organs. Thus, the stomach sympathizes with an organ, that has been long suffering under chronic irritation; there is, indeed, scarcely an organ in the body, which, when affected with protracted suffering, does not disorder the functions of the stomach, and induce vomiting. The irritation of the uvula, when elongated; and the presence of tenacious phlegm in the posterior nares, bring on a kind of 'gagging,' which is occasionally followed by full vomiting. We have examples, also, in which the nervous impression is even more remotely connected with the effects than in those we have selected. The sight of a disgusting object will turn the stomach of many. The same may be said of nauseous smells, and flavors. Riding, sailing—especially at sea—swinging, &c., develope the same sensation, and induce vomiting. In all these cases, the impression is made

on the nerves ; the great nervous centre—the encephalon—being primarily or secondarily affected. Did it indeed admit of the slightest question, that the brain must always be implicated, in the act of vomiting, the circumstance, that if the impressibility of the brain be blunted by narcotics, it is excessively difficult to excite vomiting,—a fact which has to be borne in mind when the Therapeutist is called upon to act in cases, where narcotics have been taken as poison,—would amply establish the affirmative.

In many cases, the effect of an emetic agency—although apparently produced most rapidly—must be the result of a very complex and reflex operation. When, for instance, pain in a distant organ sickens ; the brain must accomplish the sensation ; thence it must be reflected to every part of the surface of relation ; the gastric nerves must be specially impressed ; and must then call on the brain, to send the nervous influx to the organs particularly concerned in the act of vomiting.

When vomiting has continued for some time, accompanied by violent retching, more or less bile is always evacuated ; the inverted action of the stomach being extended to the duodenum ; and the irritation, produced in the alimentary canal, being propagated along the biliary ducts to the liver, so that the secretion from it becomes augmented. It is a common belief, that where bile is discharged during vomiting, excited in this or in any other way, it is a proof, that the person is—what is termed—‘ bilious ;’ but, for the reasons that have been assigned, it may be no more than an evidence, that emesis has taken place violently ; the discharge of bile being one of its effects. At times, in violent mischief affecting the intestinal canal—as in cases of colica ileus—the inverted action extends even as low down as the large intestine ; the fæces are made to clear the ileocæcal valve, and are discharged by the mouth, giving rise to the alarming phenomenon of stercoraceous vomiting ; but this never occurs from the administration of any emetic agent. It is always an index of serious lesions or obstructions of the intestinal tube.

The action of an emetic is local as regards the stomach, but it extends to almost every organ of the body. I have already said, that its effect is that of an excitant to the nervous and sanguiferous systems, so that the blood is made to circulate more freely through the capillary vessels, and in this way trifling obstructions may be removed ; but if the obstruction amounts to hyperæmia, and especially if this latter condition exist to any extent, the excited condition of capillaries will be increased. In

all the varieties of hyperæmia, that characterize local inflammation, there is, as I have attempted to shew, an overdistended and atonic condition of the extreme vessels, induced by the blood having been sent into them, under some source of irritation, in undue quantity. This overdistended state of capillaries, we have seen, gives occasion to remora of blood in them, and excites the vessels, communicating with them, to inordinate action; and it is obvious, that if, in such a state, a remedial agent be administered, whose effect is to hurry the circulatory fluid towards the hyperæmic parts, the hyperæmia may be augmented. Accordingly, it might be supposed, that emetics should act injuriously, when any of the internal organs are laboring under inflammatory action. This would seem to be a true general principle of Therapeutics, and to be especially applicable to inflammation of those viscera, which are more particularly affected, in a mechanical manner, during the operation of vomiting; but exceptions to it can be readily imagined, or rather, mitigating circumstances, which may be urged against the universality of this supervention of noxious results. In inflammation, for example, when to any great extent, there is more or less concentration of the vital energy towards the inflamed part; but the effect of the operation of an emetic is to propel the fluid of the circulation towards every organ of the body, and thus to equalize the circulation, and consequently to turn it from the "centre of fluxion,"—as it was termed by the humorists.

There is, too, another effect of emetics, which enables us to produce positively beneficial results, in internal inflammations of organs not immediately concerned in the act of vomiting, I allude to the revulsive—one of the most important of therapeutical agencies. The stomach, and the organs more immediately concerned, are, in this way, made the centre of an artificial fluxion, which detracts from that existing in some other portion of the organism. Under this joint equalizing and revulsive agency, emetics are beneficially employed in certain inflammatory affections, notwithstanding their tendency to add to the hyperæmic condition—in the manner described;—the good, effected by the equalization and revulsion, largely preponderating over the injurious tendency in question.

During the efforts of vomiting, the abdominal viscera are compressed by the contraction of the diaphragm and abdominal muscles; so that the different secretions which take place from them, are augmented; and a tendency to displacement is communicated, so that

hernial protrusions may be produced, or increased—if already existent. The different procidentia, too, of the pelvic viscera are injuriously affected by the pressure, and if the female be impregnated, it can easily be seen that abortion may be occasioned; indeed, there are certain obstetrical physiologists, who think, that the extrusion of the child, in parturition, is altogether accomplished by the contraction of the abdominal muscles,—a position, which, it appears to me, is untenable. By placing the hand on the abdomen during one of the violent throes of labour, that viscus can be felt to contract energetically; can be seen, indeed, to do so, where, as in France, the clothes are thrown up about the termination of labour, in order that the *élèves* may have an opportunity of inspecting the phenomena, connected with man's ingress into the world. Were it, indeed, otherwise, there would seem to be no necessity for the development of muscular fibres, which is found to take place as the uterus becomes distended during uterogestation.*

In the efforts of vomiting, the circulation, as I have remarked, becomes hurried, so that evil might result from it, in those, who are labouring under aneurismal or other serious lesion of the heart and arterics, and instances are on record, where the vessels have given way during retching. The circulation through the lungs becomes augmented in velocity, as it does in every other part of the frame; the secretions from the bronchial tubes are rendered more copious, and hence an emetic becomes an expectorant—an agent whose *modus operandi* will be inquired into hereafter. This effect is not facilitated alone in the manner mentioned. An additional force is invoked. The succussion communicated to the lungs, by the repeated contraction and relaxation of the diaphragm, during vomiting, not only increases the secretion, but dislodges it when secreted, so that it becomes loose and more readily expelled by coughing. Hence it happens, that a hard, and dry cough is converted into one that is loose, and free.

In the accelerated action of the organs of circulation, produced by vomiting, the capillary vessels—a part of those organs—participate; and a copious and warm perspiration usually supervenes, contrasting singularly with the cold, clammy perspiration of nausea. Hence emetics become diaphoretics.

As to their effect on the stomach itself, they may simply evacuate its contents, which may consist of food taken in, with the

* 'Human Physiology,' Second Edit. ii. 360.

secretions from the supradiaphragmatic portion of the tube as well as from the stomach itself. At times, these last secretions are morbid, and unless they are removed, they may become the *foyers* of irritation. This is especially the case in diseases accompanied with great erethism of the dermoid tissue. Whenever the cutaneous surface is extensively excited,—as indicated by great heat or by efflorescence,—the mucous membrane lining the stomach is apt to be irritated likewise, so that secretions of a morbid character take place from it; these secretions can be readily removed by the action of a gentle emetic. It is easy to see, however, that, under the excitation produced by emetics—if of a violent character—the lining membrane of the stomach must be more or less excited, and hence, a copious secretion of the mucous fluid takes place; mucus is observed to be mixed with the rejected matters, and, for the reasons already assigned, bile is generally present. But, if substances too irritating, or too violent in their action on the membrane with which they come in contact, be administered, the membrane may become inflamed and true gastro-enteritis be excited. Broussais has properly remarked,* that the specific character of emetics and purgatives is merely stimulation, which may terminate, if the dose be very large, in inflammation and ulceration of the digestive mucous membrane. He has well said, too, that the long continued employment of stimulants—as emetics—greatly exalts the sensibility of the stomach, rendering the treatment protracted and difficult, and laying the foundation of repeated relapses. “Emetics,” he remarks, “may unhesitatingly be placed at the head of the causes, which most promptly produce it, (exaltation of the sensibility of the stomach.) We have collected some very remarkable examples of this kind of lesion in persons, who had been made to vomit for many hours by incessantly repeated doses of tartar emetic, or to whom this remedy had been administered for many days in succession. It is seldom after such errors, that the physician does not observe in his patients a permanent exaltation of the sensibility, and irritability of the stomach. We have at present under our care, (August 1826,) a lady, who was subjected in 1813, by her physician, to emesis for three consecutive days, to cure a supposed gastric oppression. In the excess of his zeal, he thought it his duty to remain constantly with his patient, to make her take, at stated

* Prop. 243. and commentary.

periods, doses of tartar emetic, which he had carefully put up himself. The very next day, symptoms of disorder in the hypochondriac region manifested themselves, with which the lady had never before been affected; and, from that period, it has been impossible by any means to calm the irritability of the stomach, or to blunt the painful sympathies, which accompany digestion. We have also attended numerous other neuropathic patients, who dated their disorders from repeated emetics, administered to them by the same physician, one of the greatest *emetizers* we know.”*

Full vomiting, accompanied with much retching, or with much nervous concentration on the stomach, promotes both exhalation and absorption. The cutaneous transpiration is largely augmented, as it is in the precursory state of nausea; but the perspiration, induced at these two periods, is essentially different. In the former case, it is the healthy, energetic action of vessels, similar to that, which takes place in rude health, under the action of exercise or external warmth: in the latter, the whole system is laboring under temporary debility; and the cold clammy exudation sufficiently exhibits the diminished activity of the vital forces.

Absorption is affected by the same class of agents; but, with regard to the precise mode in which the result is produced, Therapeutists differ. It cannot be because of the augmented secretion that takes place from the lining membrane of the stomach, for that is to a trifling amount;—so trifling, indeed, that we could not expect, from this cause, that any unusual demand would be made upon the absorbents of any part of the system. We can account for absorption being more energetically exerted—in cases of dropsy, for example—after the administration of agents—as hydragogue cathartics—which occasion a greater separation of the watery parts of the blood, or, after blood has been taken from the vessels; because here the quantity of circulating fluid being diminished, a more ready imbibition of the fluid of dropsy is effected; but this explanation, as I have observed, does not well apply to the operation of emetics. We shall see hereafter, that the nervous system is largely concerned in the operation of some sorbefacient agents, and this is probably the case in vomiting. The powerful nervous concentration on the stomach, and the different organs concerned in vomiting, interferes probably with the functions of nutrition and secretion, in other parts of

* ‘Principles of Physiological Medicine in the form of Propositions,’ etc., translated by Drs. Hays and R. E. Griffith. p. 227.

the organism, so that less fluid may be exhaled, whilst that, which has already been deposited, passes readily through the coats of the bloodvessels by imbibition, and gains the torrent of the circulation. This modification of nutrition has been strongly exemplified in the disappearance of morbid growths, under the touch of royalty, the wand of the magician, and the incantations of the impostor.

From what has been said, it will be easily inferred, that emetics, like local stimulants in general, are valuable revulsive agents, although, owing to the powerful effects they produce on the whole vascular and nervous system, they may not be susceptible of such useful application as cathartics, whose operation is more circumscribed. In head affections, for example, we shall find that, whilst cathartics are of great advantage by deriving from the encephalon, and occasioning irritation in the lining membrane of the bowels—without, however, sensibly affecting the sanguiferous system—emetics may be of doubtful propriety, owing to the violence of their operation forcing the blood in quantities to the encephalon, and endangering the augmentation of any hyperæmic condition, which may be there existent. Still, in the opinion of many, no mischief arises—but rather advantage—in those very cases, in which the doubt has been raised by others.

Emetics differ largely in the period, that elapses between the time of their administration, and that of their operation; and also in the degree in which they induce nausea. The sulphates of zinc and copper, for example, act speedily; whilst the tartrate of antimony and potassa, or ipecacuanha requires fifteen or twenty minutes. This fact has given rise to a division of emetics into ‘direct’ and ‘indirect,’ or, in other words, into such as are conceived to act by impressing the nerves of the stomach primarily; and such as exert their agency in the first instance on the great nervous centres themselves.

An agent of the first class is presumed to excite such a disagreeable impression upon the nerves, distributed to the mucous coat of the stomach, that the brain immediately invokes the assistance of the different muscles concerned in vomiting, and the contents of the stomach are at once evacuated; or repeated efforts are instantaneously established to effect their expulsion.

On the other hand, an agent of the latter class is presumed to excite no immediately disagreeable impression upon the gastric nerves, but to give occasion to the act of emesis by passing into

the circulatory apparatus of the stomach; impressing the nerves distributed to the lining membrane of the bloodvessels; or reaching the brain, and making its first impression upon that organ; and the fact that many substances—as tartarized antimony—which, as regards its agency on the stomach, is equally soluble with the sulphates of zinc or copper—require such a length of time before their effects are produced, compared with those last salts, is favorable to the latter opinion: only one other view could indeed be indulged, and it is sufficiently difficult of comprehension; that the tartarized antimony requires to make a more protracted impression on the gastric nerves, than the salt of zinc; yet how this can be effected by a solution, capable of such ready absorption, is by no means clear.

The rapid emetics, as a general rule, excite the least nausea. Their action is soonest over,—is most fleeting. The vegetable emetics are generally attended with more nausea than the mineral; although the tartarized antimony, which requires about the same time before its operation commences, is considerably nauseant, and is more frequently employed to excite nausea, where such agency is demanded, than any other substance belonging to the class of emetics. The substances, which require time for their effects to be induced, have those effects supervening more gradually, and continuing longer. As a general rule, too, the rapid emetics are not productive of much retching compared with the others; and hence it is obvious, that a judicious selection of the particular emetic, for a particular state of disease, or to fulfil a certain indication, may be most important. Where the object is simply to evacuate the contents of the stomach, a rapid emetic, and one that is neither accompanied, in its action, with nausea nor retching, is clearly indicated. On the other hand, where a powerful nervous impression has to be made, one of an opposite character is demanded. Hence it is, that if a noxious substance of any kind be taken into the stomach, we have recourse to the sulphate of zinc or the sulphate of copper, whilst, in an attack of intermittent, where we are desirous of powerfully impressing the nervous system, we select the tartarized antimony, or ipecacuanha, or a combination of both.

When an emetic is given, for the purpose of simply evacuating the contents of the stomach in disease, fluid—as warm water, or warm chamomile tea, or mustard and water—may be used, especially after each act of vomiting, for the purpose of preventing retching. The fluid must, however, be allowed in modera-

tion, and, where a soluble poisonous article has been taken, but little fluid must be permitted, unless it can be removed from the stomach, by the stomach pump, immediately after it has been swallowed, or is likely to be evacuated at once under the action of an emetic. Hence, dry vomiting is advised in such cases. Where the tartarized antimony is administered to children, as an emetic, it may be well to allow the child to suck or drink before the operation comes on, as the salt, it is asserted, has been found to produce poisonous effects, when taken apparently on an empty stomach. Professor Hamilton, of the university of Edinburgh, has affirmed, that more than one such case has presented itself in his practice.

If the object of the practitioner be to excite a new nervous impression, the greater the amount of retching the better,—that is, within due limits. At times, emetics not only produce emesis, but they excite violent catharsis; or they may induce the latter effect without the former. In such cases, a few drops of laudanum have succeeded apparently in restricting their operation to the stomach. In very irritable individuals, too, the emesis will go on to an inordinate extent, almost exhausting the individual by the repeated retching and vomiting. The carbonic acid—as contained in soda-water—or as given off by the union of tartaric acid and carbonate of soda, is often useful here; or opium, or rubefacients to the epigastric region, may be demanded.

I have already referred to the evils resulting from the repeated employment of emetics, as regards the gastric functions, as well as to the mischief they may induce in particular states of the system. One other inconvenience resulting from them,—or rather said to result from them, but of which I have never seen an example,—is that of inflammation of the extremities, followed by gangrene. M. Barbier—an eminent French writer on Therapeutics—has given the following case from the *Journal de Médecine*, vol. 38.—A woman, of a constipated habit, had used many means for producing catharsis, but ineffectually, when a surgeon to whom she applied, administered a violent preparation, which operated both upwards and downwards. Cramps, convulsions of the limbs, and great anguish supervened. Immediately afterwards, she was attacked with severe lancinating pains of the extremities, and ecchymosis appeared on different parts of the body. Gangrene attacked the cartilaginous portion of the nose, the lower lip, the skin of the chin, the points of two toes of the right foot, and the great toe of the left, all of which successively drop-

ped off.—To this case Barbier adds one of his own. A woman, of the Faubourg d'Amiens, having procured a cathartic remedy from an herbalist, was attacked, after taking it, with incessant vomiting and purging, which rapidly reduced her strength. She was taken to the Hôtel Dieu. Next day, the point of the nose, the ears, and the cheeks became of a deep violet hue, and soon afterwards the same color spread over the feet and the hands; and gangrene rapidly attacked all these parts. She lost one of her feet, and several toes of the other.”*

These cases do not, however, seem to me to prove incontestably, that the gangrene was dependent upon the use of the emetics. They may have been coincident, instead of consequent; and if any such evil had to be apprehended from them, we ought to possess a greater number of examples, instead of the two cases, above referred to.

After this full investigation of the general effects consequent on the administration of emetics, their therapeutical application to particular diseases will be readily intelligible.

In intermittent fevers, they are employed with two views,—to excite a powerful nervous impression, or to simply evacuate the contents of the stomach; and, according as the practitioner has either one or the other of these objects in view, he may select his particular emetic accordingly.

For exciting a powerful nervous impression, an emetic, which produces much nausea and vomiting, is, as I have inculcated, to be preferred; whilst if simple evacuation be desirable, it matters not how trivial the nausea or disorder may be.

Practitioners, however, generally have recourse to tartarized antimony and ipecacuanha, singly or combined. The latter is the more certain agent, and it has the advantage, that no very great attention is required to the dose,—thirty grains usually producing as much effect as sixty.

Where the object is to arrest the paroxysm of an intermittent, the emetic should be exhibited a short time before the cold stage is expected; and should it even not have the effect of completely arresting the fit, it will often essentially mitigate it.

*Barbier, *Traité élémentaire de Mat. médicale*, t. iii. p. 323; and A. T. Thomson, *Op. cit.* p. 200.

The first impression, made by an emetic of antimony or ipecacuanha, is one of diminished action; the second is one of equalization; so that although the former might appear inappropriate in a case of diminished action like that of the cold stage of an intermittent, the latter operation might be decidedly advantageous; and this latter operation, it would seem, predominates over the former, inasmuch as no evil is found to result from the employment of emetics in the cold stage. Even in those pernicious intermittents—the *febres algidæ*, as they have been termed—in which reaction, if established at all, is so with difficulty—they have been found decidedly useful. In such cases, emetics, which produce the equalization without the depression, are obviously more indicated—as the sulphate of zinc, or the sulphate of copper—but those of the indirect kind have been exhibited with impunity, and even with advantage.

In the hot stage, emetics have likewise been administered, but they seem to make less impression where all is exaltation, and are, obviously, not as much indicated as when the action is to a less extent,—although nauseants may be most useful.

The truth is, that, during the paroxysm of an intermittent, it is not generally necessary to do much. The management on general principles is alone necessary;—administering hot fluids in the cold stage; cold, in the hot; and tepid in the sweating.

In the state of apyrexia, they are a good preparation for the administration of tonics, which are thus enabled to come into immediate contact with the lining membrane of the stomach, and to exert their appropriate agency on it, and, through it, on the rest of the nervous system; and, in all periods of the affection, a gentle emetic, given merely to remove morbid secretions, may be advantageous, but their repeated use must be avoided.

In remittent fevers, which are commonly accompanied by more or less inflammation or irritation in the lining membrane of the stomach and intestines—especially of the upper portions of them—violent emetics are not advisable; but gentle evacuants may be administered not only without detriment but with advantage. Their repeated use, however, in such cases, is apt to augment the irritation, already existing in the mucous membrane of the digestive tube, and to increase the sensibility of that of the stomach in particular to an inordinate degree.

Of late—as is well known—it has been attempted to shew, that all fevers depend on gastro-enteritis, an opinion first por-

pounded in the most unqualified terms by Broussais,* but afterwards somewhat modified by himself, and still more by his followers, many of whom—although they are disposed to esteem themselves ‘Broussaists’ in respect to their views on fever—differ widely from their great archetype, and are altogether renounced by him. Such are those, who consider many varieties of fever,—as the ataxo-adynamic,—dependent upon dothineritis or follicular gastro-enteritis; in other words, who think the inflammation seated in the isolated and agglomerated follicles, which stud the lining membrane of the intestinal tube, and that the general febrile symptoms are merely the result of such inflammation. The whole object of these views, according to the distinguished author of the ‘physiological system,’ is to destroy the theory of gastro-enteritis as the source of fevers.†

Were all fevers accompanied by, or referable to, gastro-enteritis—simple or complicated—the question, respecting the propriety of administering the more powerful emetics, might be easily settled. They would obviously be inappropriate. This does not appear to be always the fact, although, in perhaps the majority of cases, more or less evidence of inflammation may be found on dissection in the lining membrane of the tube. Such an appearance is not indubitable evidence, that the fever was referable to the inflammation; but might rather be employed to corroborate the opinion, that the signs of phlogosis supervened in the course of the fever. It is impossible for the deranged and irregular action of organs, which constitutes fever, to exist for any great length of time, without signs of irritation occurring, especially in the dermoid tissue, the functions of which, in every part, are invariably disordered in every attack of fever, of whatever kind it may be.

From the equalizing effect of emetics, they may be used at the commencement of almost all fevers with advantage; and, at times, they would appear to cut short the complaint, although probably much less frequently than has been imagined.

In cases of ephemera, which most frequently occurs in children, but, at times, in adults also, and is dependent upon gastric disor-

* Prop. 139. “All the essential fevers of authors are referable to simple or complicated gastro-enteritis.”

† “Le but a été de détourner l’attention de la gastro-entérite et de la faire tomber.” ‘Cours de Pathologie,’ etc. Par. F. J. V. Broussais, t. i. p. 620.

der, produced by errors in diet, emetics are obviously indicated, and by removing the cause of the fever, they put an end to the febrile action; but it is not easy to cut short a continued fever, after it has gone on for some days, by this or by any other system of medication. Such, at least, has been the result of my observation, and it tallies with that of others, whose opportunities have been extensive. In almost all fevers, termed 'continued,' two exacerbations in the day can be perceived;—the one about midday; and the other in the evening; and it has been conceived, that where the object is to cut short the fever, the emetic, as in the case of an intermittent, should be given a short time before the expected exacerbation, and especially before that in the evening, which is usually more marked than the other.

The *modus operandi* of emetics, in cutting short a continued fever, is the same as in the case of intermittents;—that is, by the revulsion they produce; and the equalizing influence they exert on the sanguiferous and nervous systems. Hence, they are occasionally advantageous in the major exanthemata, especially when the eruption does not appear kindly and equably over the surface; but appears to be restrained or repressed, in consequence of irritation existing in some internal organ. Broussais, with the air of dogmatism, that is too apparent in all his writings, lays down a law of action, which admits of many exceptions.—“Emetics cure gastro-enteritis solely by the revulsion, and the critical evacuations which they provoke: their effect is then uncertain in mild cases; and, in severe ones, they are always dangerous, because they *never fail* to augment the inflammation, when they do not succeed in removing it..”—Prop. 287. And, again, “Emetics, purgatives, and tonics, which act by revulsion, effect only temporary cures in chronic gastritis and gastro-enteritis, and render the radical cure more difficult.” Prop. 349. ‘Propositions,’ which must be regarded as mere assertions emanating from a distinguished mind, but not on that account to be received as authority in the absence of evidence.

It need scarcely be said, that in continued fever morbid secretions must take place from the mucous lining of the alimentary tube as in remittents and intermittents, but as these can generally be evacuated by cathartics, they are usually employed to the exclusion of emetics.

In the different phlegmasiæ, emetics are much used. In some, however, they are more effective than in others. In tracheitis

or croup, they are given in very different stages of the disease, to fulfil different indications,—and with equal propriety. The disease is seated in the lining membrane of the trachea, and it belongs to the mucous affections, to which—as we have seen—the name ‘diphtheritis’ or ‘angina pellicularis,’ has been appropriated; that is, to affections in which a false membrane, of the nature previously described,* is thrown out as the product of inflammation.

At the commencement of an attack of tracheitis, an emetic, by exciting a salutary revulsion, and equalizing the circulation, will frequently put an end to the inflammation, and even if the disease has made some progress, it is a valuable agent, after bloodletting has been premised. Accordingly, it is one of the remedies most employed in the early stages of tracheitis.

It is equally indicated after the albuminoid secretion has been thrown out from the membrane; but it must obviously be a matter of extreme difficulty, by any agency, to cause the detachment of the false membrane, and its expulsion through the narrow chink constituting the rima glottidis; yet the best expectorant agency, we can exert, is effected by the succussion, which the action of an emetic occasions.

The same remarks apply equally to the inflammation of the lining membrane of the larynx, constituting laryngitis.

In amygdalitis or inflammation of the tonsils, as well as in pharyngitis, œsophagitis, the same good effects are produced by the revulsive and equalizing agency of emetics; and when suppuration has supervened on the inflammation, and the abscess is seated so low down in the pharynx or œsophagus, that it cannot be reached by the instrument of the surgeon, the operation of an emetic may cause it to break. With this view, one of the direct emetics may be chosen. No great impression on the nervous system is needed. The expulsive efforts are alone required; and the sulphate of zinc, or the sulphate of copper is capable of fulfilling every indication. In the malignant varieties of cynanche, which so often accompany scarlatina, emetics are frequently administered. Much curative influence cannot, however, be expected from them, except at the very commencement of these affections, but at a subsequent period, they may be admi-

* See page 181.

nistered with the view of removing the viscid secretions, which excite so much annoyance in the course of the disease.

Emetics are much employed in different diseases of the chest. In pneumonia, they are not often used before the activity of vessels has been diminished by the proper remedies; but when the inflammation has been somewhat subdued, their equalizing and revulsive influence becomes strikingly apparent. They favour the discharge of the bronchial secretions, by the succussion they give to the lungs; and, for this reason, they are employed with considerable benefit in chronic bronchitis.

They are likewise, extremely beneficial in spasmodic cough, as in hooping cough, and in asthma. Both these diseases are dependent upon a morbid condition of the nerves of the respiratory organs—the pneumo-gastric especially—which modifies the contractility of the muscular fibres, that surround the minute bronchil ramifications; and this state of the nerves is generally perhaps connected with more or less morbid derangement of the parts of the cerebro-spinal axis, whence the nerves originate. Hence, the utility of producing a revulsive effect by means of these or other agents. Expectoration is also favored by them, in the manner just mentioned, and it has been long remarked, that those children suffer least from hooping cough, who eject the contents of the stomach during each fit of coughing.

It is in head affections, that the use of emetics might seem most doubtful. In phrenitis, they are generally esteemed inadmissible; and, as the pain in the head is almost intolerable, their operation can hardly fail to aggravate the symptoms, notwithstanding their revellent and equalizing tendency. The same remarks are applicable to their employment in apoplexy. The violent efforts,—forcing the blood with greater impetus to the head by the arteries, and retarding its return by the veins,—appear inappropriate, in cases in which hyperæmia already exists in the encephalon, yet their revellent properties would seem to have rendered them useful in ophthalmia, when bloodletting, counterirritants, &c. had been prescribed, and the disease had, notwithstanding, remained stationary. In these very cases, the same substances, employed so that their operation shall be confined to exciting nausea, are amongst our most valuable remedies, and not only in these affections, but in every variety of phlegmasia.

Amaurosis is said by Richter to have been beneficially treated by emetics, but much reliance obviously cannot be reposed in them, when the retina, or the optic nerve, or the part of the brain in which the optic nerve arises, is affected with paralysis. Impaired or depraved vision often originates sympathetically from disorder of the digestive function; at other times, it is owing to lesion of the eye itself, or of the cerebral part of the organ of vision; hence we have the affection, termed 'myodesopsia,' or 'muscæ volitantes,' as symptomatic of one or other of these morbid conditions; and hence the various hallucinations, illusions or waking dreams, which occur in diseases of the encephalon, as mania and hypochondriasis; but which are often produced in persons of sound mind, but of nervous systems unusually impressible, and easily acted upon by irritations in the stomach or elsewhere.

Where the primary mischief, in such visual affections, is in the stomach or intestines, emetics are more likely to afford relief, than when the depravation is originally seated in the encephalon.

In some local affections—as in bubo, and orchitis—the repellent action of an emetic is often most beneficial. The inflammation may have been vigorously attacked by the proper antiphlogistic measures, yet the swelling may remain stationary. If a powerfully repellent nervous impression be now made, by exciting emesis, the swelling will frequently disappear rapidly. I have very recently had two cases of orchitis under management, circumstanced as just mentioned, which yielded almost instantaneously under the employment of an emetic, aided, however, by the application of a warm cataplasm to the part.

In the very early stages of orchitis, or of bubo, the revulsion, thus produced, is by no means as efficacious. The excited state of vessels predominates too much to be broken in upon by any impression upon the nervous system. The action of vessels must be reduced by antiphlogistics, and then emetics can be had recourse to with full advantage.

In consumption, emetics were at one time considered the best remedies, that could be advised; and, according to Dr. Young—in his work on pulmonary consumption—a majority of the cures of phthisis have been effected by emetics or by nauseating remedies. This idea has probably originated from the good ef-

fects often observed to follow a sea voyage, which is usually accompanied by sea sickness, but the fallacy, in this case, consists, in referring wholly to the nausea that, which may be produced by the greater equability of temperature at sea, and by the new impressions made upon the mind and nervous system generally of the voyager, through the altered barometrical, hygrometrical, thermometrical, electrical and other influences of the atmosphere, and the new scenes in which he is placed. Even in the early stages of phthisis, when alone any course of medication can be expected to be effective, emetics are, at the present day, but rarely had recourse to; and in the later periods of the disease, they are not only useless, but add to the irritation and debility already present.

In gastritis, and in enteritis, emetics are manifestly not needed, and would probably be injurious; nor would they appear to be indicated in spontaneous vomiting; but, as diarrhœa is often kept up by irritations in the intestinal canal, and requires the administration of a cathartic to remove them; so vomiting may suggest the use of an emetic; and even when the spontaneous vomiting has persisted after the contents of the stomach have been evacuated, the new action, induced by an emetic, may break in upon the disorder of function, and remedy the evil.

In cholera—both of the indigenous and spasmodic variety—gentle emetics are prescribed by some practitioners, and, as means for the removal of morbid secretions, they may be useful; but it is not clear, that they ought to be regarded as remedies of much efficacy in affections that are dependent upon an irritated or excited state of the gastro-intestinal mucous membrane, and which yield with the subsidence of the inflammatory irritation, or terminate unfavorably, when the morbid affection of the membrane in general, and of the exhalants in particular, is excessive.

In cases of malignant cholera, the stimulating emetics—as mustard—have been most frequently employed,—the inflammatory irritation of the mucous membrane, in these malignant cases, being occasionally diminished by gentle excitants, as we have seen it may be in affections of the mucous membranes in general, when the overdistended state of extreme vessels is the prominent pathological lesion. A main part of the benefit, however, accruing in such cases, is probably derived from their revulsive operation,—the chief pathological mischief being usually situated

lower down in the tube. It has, indeed, been a question, with some Therapeutists, whether advantage might not be derived, in these unfortunate cases, from remedies that would even inflame the lining membrane of the stomach; but such a harsh revulsive plan of medication can, of course, be scarcely available.

In diarrhœa, and dysentery, where the irritation is seated lower down in the tube than in the stomach, an emetic may, in this way, produce good effects as a revulsive; but, in the latter disease, the violence of the inflammation must be previously subdued by the appropriate agents. It would seem, too, that in certain cases of constipation, accompanied with spasmodic constriction of the muscular coat of the intestines, emetics, administered after bloodletting, have relaxed the spasm, so that the bowels have been relieved, or gentle cathartics have been sufficient.

In dysentery, the seat of which is chiefly in the lining membrane of the large intestine, the revellent and equalizing effects of emetics are beneficially manifested.

In acute rheumatism, and in gout, emetics are not much used, although occasionally their operation—as revellents and equalizers—might be advantageously exerted. In the latter disease, too, connected, as it is, with considerable gastric disorder, their use might seem to be more especially indicated; and in both diseases they may be demanded, for the removal of morbid secretions or undigested matters from the tube,—a result, which can generally, however, be accomplished by the use of gentle cathartics.

After what has been said of the general mode of action of emetics, and of their application to the ordinary phlegmasiæ, their agency in hemorrhages will be apparent. In epistaxis, they cannot be required, and their employment in apoplexy,—we have already seen,—is a more than questionable measure. The same, it has been thought, might be said of hæmoptysis. Although their equalizing and revulsive operation might act advantageously; it has been conceived, that the activity, they occasion in the vascular movements, might more than compensate for their salutary agency. Yet, it has not been found, that hæmoptysis, symptomatic of phthisis, has recurred, or been increased at sea

during the retching of sea sickness.* In such cases, nauseating doses are recommended, which, as I have said, produce an effect of a directly opposite character, so as to give occasion to their being classed amongst agents, which diminish action.

In hæmatemesis, emetics have been recommended by some, with the view of removing the accumulations of blood, which form in the stomach, and they may be of service. The hemorrhage, in these cases, is generally venous, and takes place by diapedesis or transudation;—often owing to visceral engorgement, which prevents the blood from circulating freely in the engorged organ, and occasions irregular congestions in other parts. In the wards of the Baltimore Infirmary, we annually meet with many cases of hæmatemesis, melæna, and epistaxis, occasioned by engorgement and induration of the liver or spleen, especially the latter, acquired in the malarious counties of Maryland and elsewhere. Here, the proper treatment of the hemorrhage necessarily merges in that of the primary affection on which it is dependent.

Now, in cases of hæmatemesis, the action of the stomach, induced by an emetic, may occasion the removal of the venous congestion, and the pressure of the muscular coat of the viscus on the vessels exhaling the blood may contract their dimensions, and tend to arrest the flow, somewhat, perhaps, in the manner that the hemorrhage is arrested in the next variety we have to consider.

Uterine hemorrhage—as we have before seen—may occur, prior to, during, and subsequent to, the delivery of the child. In all cases, it is produced by a discharge from the uterine vessels. The old idea, universally entertained, was;—that the vessels of the mother pass directly to the placenta, and pour their blood, by open mouths, into the maternal portion of that organ. Under this view of the subject, hemorrhage would be produced by a rupture of the maternal vessels. More recent observers have satisfied themselves, that there is no direct communication between the uterine vessels and the placenta, but that these vessels coast along the uterine parietes in a direction parallel to the placenta, having, however, portions scooped out of their sides, which portions are closed, either directly or indirectly, by the placenta. Under this view, there can of course be no maternal and foetal

* *Elements of Hygiène,* p. 133.

placentæ; the whole is fœtal; and hemorrhage arises from the detachment of the decidua or of the placenta from the apertures in the uterine vessels. Whatever, therefore, induces contraction of the uterus, occasions the reapplication of the placenta, or of the body of the child to the vessels whence the hemorrhage proceeds, and arrests it. These remarks apply, of course, only to hemorrhage occurring prior to, or during delivery, and then only to cases in which the placenta is situated elsewhere than over the os uteri.

In uterine hemorrhage, following the delivery of the ovum, the hemorrhage is arrested by causing the uterus to contract upon itself, and thus to obliterate, as it were, the maternal vessels. Now emetics, which call into action the abdominal muscles, facilitate this result, although they are but rarely had recourse to, seeing, that the obstetrical practitioner has more effectual means of attaining his object.

In dyspepsia, emetics are occasionally had recourse to, but they must be employed with caution. A gentle emetic removes indigestible matters and morbid secretions; and produces an excitation in the stomach, which may be salutary; but repeated emetics, as has been previously shewn, injure the tone of the organ, develope its sensibility, and augment the very affection they were administered to remove.

In jaundice, dependent—as it often, if not always, is—on some impediment to the flow of bile along the biliary ducts into the duodenum, and especially when produced by a gallstone, the inverted action and the succussion, induced by the operation of an emetic, are often most beneficial, and the same remark holds good in the case of chololithus or gallstone, without jaundice. Here an emetic should be selected, whose operation is preceded by nausea—as tartar emetic or ipecacuanha—the relaxing influence of which is first felt, and this is immediately succeeded by the propulsive efforts, which are, at times, successful in causing the calculus to clear the biliary passages.

It has been properly remarked by Dr. Stokes, that emetics are more advantageous and safe, in the early than in the later periods of jaundice, especially when there is reason to believe in the existence of organic disease of the liver; and also, that they should be used with caution, when there is evidence of distension of the gall-bladder,—indicated by a tumor felt on pressing the right hy-

pochondrium. Under such circumstances, the operation of an emetic has been known to occasion rupture of the gall-bladder and fatal peritonitis.

In mental alienation, emetics were, at one time, much advised, and some of the most noted remedies possessed properties of this kind. They are not given at the present day, unless symptoms should arise in the course of the disease, to indicate their use. In the cases, in which they are presumed to have exerted a salutary agency, this was probably accomplished less by their acting as evacuants, or through modifications induced in the circulation, than by the new impression made by them upon the nervous system. Hence they are occasionally used in mania, to interrupt intense abstractions. When the insane obstinately determines to retain his urine and fæces, an emetic will often succeed in breaking in upon the determination; and the same applies to those who are affected with mania a potu—the delirium tremens—of British writers.

In all such cases, emetics have to be given in larger doses than usual. The encephalon being in a state of excitement, and employed in its own acts, it is less affected by impressions made on other organs, and consequently requires a larger amount of the impressing agent; but if the energy of the system be first reduced by a copious abstraction of blood, then the ordinary dose of the emetic may produce its accustomed effects.

In hypochondriasis, which is also an encephalic disorder, accompanied generally with much gastric derangement, an occasional emetic often acts beneficially, by exciting a new action in the nervous system, and giving a fillip to functions, carried on with unusual torpor.

In epilepsy, and in the convulsions of children, emetics are not only excellent prophylactics, but valuable curative agents. Where organic mischief does not exist, these diseases are usually induced by great mobility, or impressibility of the encephalon, developed by irritation in some other part of the system, and especially in the digestive tube. Often, this is produced by indigestible diet, or by morbid secretions, and when the prodromic, or premonitory symptoms of the attack are present, a timely emetic will often prevent the paroxysm, by removing the cause, and by exciting a new nervous impression, as in the case of intermittents.

The same kind of revulsion, induced in the same manner, is, at times, salutary in hysteria, as well as in the different forms of neuralgia. The impression is powerfully exerted on the stomach, and thence it irradiates to every part of the nervous system, and, by equalizing the nervous distribution or influx, detracts from its intensity in any given situation.

Lastly, emetics have been frequently exhibited in the different varieties of dropsy, and they are obviously calculated to act as sorbefacients in such cases ;—not so much in consequence of any increased action of the exhalants of the lining membrane of the stomach, which they may occasion, as by their revulsive operation. Dropsies, as we shall see, have been known to disappear under powerful mental emotions, and not only dropsies, but depositions of solid materials, and we can, therefore, understand, that these affections may diminish under the nervous derivation excited by an emetic. They cannot, however, be repeated sufficiently often to produce much salutary influence, for fear of injuring the tone of the stomach ; and, accordingly, they are but rarely employed in the treatment of hydropical affections.

Such are the diseased conditions in which emetics are especially serviceable. It is obviously impossible to specify every variety of organic lesion in which they may be salutary. Enough has been said of their general properties, and particular applications, to suggest the cases in which their administration is indicated.

TABLE

OF THE CHIEF EMETICS, AND THEIR OFFICIAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Antimonii et Potassæ Tartras. Antimonium Tartarizatum. <i>Tartrate of Antimony and Potassa.</i> <i>Emetic Tartar.</i> (A Tartrate of Potassa, united to a Tartrate of Antimony.)		Vinum Antimonii. (Antim. tart. et potass. scr. 1; vin. f. oz. 10.	gr. 2 to 4. f. dr. 2 to f. oz. ½
Cupri Acetas. <i>Acetate of Copper.</i> (See Table of Tonics.)			gr. 1 to 2.
Cupri Sulphas. <i>Sulphate of Copper.</i> (See Table of Tonics.)			gr. 2 to 5.
Emetina. Emetia. Emetine.	The active principle of the different species of Ipecacuanha.		gr. ½ to 4 (of the impure.) gr. 1-16th to (of the pure.)
Gillenia. <i>Gillenia.</i> Spiræa Trifoliata. <i>Indian Physic.</i> <i>American Ipecacuanha.</i> (The root of the <i>Gillenia Trifoliata</i> , or <i>Spiræa Trifoliata</i> of the U. States.)			gr. 20 to 30.
Hydrargyri Sulphas flavus. <i>Yellow Sulphate of Mercury.</i> <i>Subsulphate of Mercury.</i> <i>Turpeth Mineral.</i>	By throwing a sulphate of mercury into boiling water.		gr. 2 to 5.
Ipecacuanha. <i>Ipecacuanha.</i>	(The root of the <i>Cephalis Ipecacuanha</i> , or <i>Callicocca Ipecacuanha</i> , and the <i>Psychotria emetica</i> .)	Vinum Ipecacuanhæ. (Ipecacuanhæ contus. oz. 1; vin. O l.	gr. 20 to 30. f. dr. 2 to f. oz. ½
Lobelia. <i>Indian Tobacco.</i> (The herb <i>Lobelia inflata</i> of the United States.)			gr. 5 to 20.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Sanguinaria. Blood Root. (The root of the <i>Sanguinaria Canadensis</i> of America.)	}	Tinctura Lobeliæ. (Lobel. oz. 4; alcohol dilut. O ij.)	f. dr. 1 to f. oz. $\frac{1}{2}$
		.....	gr. 10 to 20.
Scilla. Squill—Sea Onion. (The bulb of the <i>Scilla maritima</i> .)	} From the Levant.	Tinctura Sanguinariæ. (Sanguinariæ cont. oz. 4; alcohol dilut. O ij.)	f. dr. 3 to f. oz. $\frac{1}{2}$
		.....	gr. 6 to 15.
		Acetum Scillæ. (Scillæ oz. 4; acet. distill. O ij.; alcohol f. oz. 1. Macerate in the vinegar for seven days, strain, and add the alcohol.)	f. dr. 2 or dr. 3.
		Mel Scillæ compositum. <i>Hive Syrup.</i> (Scillæ cont. senekæ rad. cont. ana oz. 4; antim. tart. et potas. gr. 48; mel despum. lb. 2; aq. distill. O 4; boiled down to lb. 3.)	f. dr. $\frac{1}{2}$ to dr. 2; repeated until it operates.
		Oxymel Scillæ. (Mel. desp. lb. 3; acet. scillæ O 2. Boil to a proper consistence.)	f. dr. 2 to f. oz. $\frac{1}{2}$ or more.
		Syrupus Scillæ. (Acet. scillæ lb. 1; sacch. lb. 2.)	f. dr. 3 to f. oz. $\frac{1}{2}$ or more.
Sinapis. Mustard. (The seeds of the <i>Sinapis Alba</i> and <i>Sinapis Nigra</i> .)	}	Tinctura Scillæ. (Scillæ oz 4; alcohol dilut. O 2.)	f. dr. 1 to f. dr. 2
		.....	dr. 1 to dr. 2 of the powder.
Zinci Sulphas. Sulphate of Zinc. (See Table of Tonics.)	}	.....	gr. 10 to 30.

SECTION VI.

CATHARTICS.*

Definition of cathartics—Effects they are capable of inducing—Organs on which they act—Divided into laxatives and purgatives—Drastics—Abuse of cathartics—Glysters—Suppositories—Therapeutical application—In fevers—In inflammatory disorders—In hemorrhage—In the neuroses—In dropsies, &c.

THE simplest definition of cathartics is—‘agents that increase the number of alvine evacuations.’ Some writers on Therapeutics have endeavoured to incorporate in the definition their *modus operandi*; and, in a modern work, the definition is still farther, and with less propriety, extended,—so as to include other effects which they may or may not induce. Thus, the Messrs. Schroff† define them to be;—“Medicines, which, by augmenting the secretion and peristole of the intestinal tube, occasion the evacuation by the anus of accumulated and noxious matters:” but it is obviously not necessary for the induction of catharsis, that there should be any accumulation—physiological or pathological, or noxious—in the bowels. The definition is, consequently, faulty.

There is no class of medicinal agents possessed of more valuable properties, and none more abused than the one under consideration. Exposed, as the digestive organs are, to the intrusion of the most heterogeneous and often irritating substances, and liable to have their tone injured by alternations of stimulation, and the opposite condition, accumulations of food as well as of secretions are apt to occur, which demand the use of cathartics;

* Dejectoria, Eccathartica, Hypactica, Lapactica, Apocathartica, Coprocrítica; from καθαίρειν ‘to purge.’

† Taschenbuch der Arzneimittellehre, u. s. w. s. 63.

their effect, too, is not confined to the mucous membrane of the alimentary tube; through the nerves, it can be propagated elsewhere, so as to react on organs, situated at a distance from the seat of the remedial impression.

To fully comprehend the effects which cathartics are capable of inducing, let us briefly consider the organs and tissues on which other operation is immediately exerted.

The mucous coat of the small and large intestines is an extension of that of the stomach, and, with some modification, of that of the supra-diaphragmatic portion of the digestive tube; whilst this, again, may be looked upon as an extension of the cutaneous envelope of the body.

Like the mucous lining of the stomach, that of the small intestines is a part of the surface of relation, and impressions, made upon it, are probably conveyed, with equal facility, to the great nervous centres—cerebro-spinal or ganglionic. Hence, it is, that it has been regarded by Broussais as the seat of many important diseases, of a febrile character especially.

In the mucous coat are situated many of those mucous follicles, which, in consequence of their having been described by Brunner, Peyer, and Lieberkuehn, have been called after those observers. Their function is to secrete mucus for lubricating the mucous membrane; but, of late, their importance in the economy has been exaggerated, and, as I have previously remarked, they have been looked upon as the seat of many of those ataxic and adynamic fevers, which Broussais refers to the mucous membrane generally. It does not appear probable, that these small follicles can be so intimately associated, in their morbid derangements, with the great vital organs, as to give occasion to the diseases, that have been ascribed to them. Their function seems to be similar to that of the sebaceous follicles of the cutaneous envelope, and they have not perhaps any great agency in the causation of disease. Frequently, on dissection they are found considerably enlarged, but never without the mucous membrane exhibiting simultaneous evidences of disease: their increase in size is probably owing to their forming part of the lining of the tube, as Broussais has suggested. The whole of his remarks, indeed, on the subject of follicular gastro-enteritis, are characterized, in my opinion, by great truth, and sound argument.

The mucous membrane, besides the secretions of the follicles, exhales the ordinary halitus of the mucous membranes, and the

two together are to a considerable amount. The daily quantity, indeed, of the 'liquor entericus' or 'succus intestinalis,' as it has been called, was estimated by Haller at probably far beyond its real amount.

In addition to this humour, the upper part of the small intestine receives the secretions from two important organs,—which, from their presumed agency in chylosis, have been termed 'assistant chylopoietic viscera,'—the liver, and the pancreas, whose ducts open together into the commencement of the small intestine.

From the upper portion of the small intestine more especially, the chyloferous vessels arise :—this part of the tube must therefore be regarded as the great seat of chylosis, or chylicification.

It is not until the fæces have attained the lower part of the small intestine, or the commencement of the large, that they attain the full fæcal odor. This is not produced altogether by the reaction of the elements of the food upon each other, but by a peculiar secretion; so that alvine discharges, possessed of the full fæcal odor, may take place, even when little or no food has been taken; and, in the course of febrile affections, it becomes important to remove those, should constipation arise, as they are capable of inducing as much irritation as if they were the product of the digestion of alimentary matter. So long as life persists, secretions are poured into the alimentary tube throughout its whole extent, from the lining membrane, as well as from the liver and pancreas; and if these are permitted to remain in the canal, they become the *foyers* of irritation, and mischief. The argument, often urged,—that it is not necessary, that the bowels should be kept open, in morbid cases, because no food has been taken,—is, therefore, extremely erroneous.

Although in the upper portion of the small intestines an arrangement of the mucous coat exists, calculated to detain somewhat the aliment in its course downwards, and to extend the surface for the origin of chyloferous vessels; in no part of its extent, does it present the character of a reservoir. The opposite to this is the case with the large intestine. Its saccated arrangement clearly shews it to be destined for the detention of the fæcal matters, until they have accumulated to such an extent as to give rise to the necessity for the action of defecation.

In these saccated portions, the fæces are occasionally retarded, become indurated, and adhere to the mucous membrane, so as to excite considerable irritation: and, when evacuated, they are in

the form of small rounded masses, to which the name 'scybalæ' has been given.

The whole of the intestinal canal is more or less endowed with the vermicular, oscillatory motion, which has been called 'peristole,' or 'peristaltic action.' This motion is not under the influence of the cerebro-spinal, but of the ganglionic nerves, through which the muscular coat of the tube is excited to contraction, and the degree in which contraction occurs is greatly connected with the mode in which the function of digestion is accomplished.

Lastly, it is important to keep in view, that various organs are contiguous to the alimentary tube, whose functions are susceptible of modification by agents that affect it. I have already referred to the liver, and the pancreas; and we shall find, that the uterus can, in this way, be considerably modified in its actions.

As regards the effects of cathartics on the intestinal canal, much difference exists according to the nature of the cathartic, and the dose in which it may be exhibited.

When the lining membrane is but slightly stimulated, chylus simply may be augmented, and a laxative tendency be induced; if it be more stimulated, the exhalation from it may be increased, and the irritation be extended, by the sympathy of contiguity to the muscular coat, so that there may be a slight increase in the peristole; and if the specific stimulation be yet greater, both the exhalation and the peristole may be largely augmented.

The effect of a mild cathartic may be almost wholly restricted to the evacuation of the tube, and but little effect be exerted on other organs, or on the general system. The first evacuations, which result from its operation, may consist merely of the contents of the intestines: those that follow are mixed with the secretions of the canal, and of the liver and pancreas, with the drinks that may have been taken; and at times, fluids—as soups—may be readily detected in the discharges. Yet, as the appearance of an unusual quantity of bile, in the matters ejected by vomiting, may merely be an evidence, that the excitement accompanying emesis has caused a greater secretion of bile, so—it must be borne in mind—the alvine discharges may assume an unhealthy bilious character, under the operation of a cathartic, owing solely to the irritation it induces in the various secretory organs of the digestive apparatus. If we administer calomel as

a cathartic, it irritates the lining membrane of the duodenum, and this irritation extends along the biliary ducts to the liver, the secretion from which is augmented. At the same time, the cathartic irritates the different follicles of the canal, and the exhalants generally, so that evacuations are occasionally induced by it, which resemble chopped spinach, and which are regarded by some, as indicating, that the calomel has succeeded in inducing a new action in the mucous membrane of the digestive tube. We can, hence, understand, that after the operation of calomel, or of any purgative, whose action is chiefly exerted on the upper portion of the intestines, there may be manifest appearances of bile in the evacuations, without our being justified in inferring, that the individual is bilious; and, that the increased flow of bile is occasioned by the purgative may be proved by discontinuing its use for some days, when the signs of bile in the evacuations will cease, and be reproduced, when its use is resumed.

I have mentioned, that calomel affects the upper part of the intestinal canal; and the same may be said of rhubarb, colchicum, colocynth, &c. There is, indeed, a singular preference on the part of different cathartics for different portions of the tube; some,—as the articles enumerated,—acting on the upper part; others,—as aloes,—on the large intestines, and especially on the colon and rectum; and others,—as the saline and oily,—affecting the whole of the tube. Accordingly, a selection may be made from the class so as to suit the particular view of the practitioner. If the diseased action seems to demand one, that affects one portion rather than others, experience has enabled us to make our choice accordingly. At times, too, we are desirous of affecting other organs through the intestinal canal, by means of sympathy; as, when we wish to affect the liver or pancreas,—in which case we choose cathartics, that act upon the part of the tube into which their ducts enter,—or the uterus, when we select one, that acts by preference on the lower portion of the tube, and affects the uterus by the sympathy of contiguity. It is in this way, that aloes has acquired its reputation as an emmenagogue.

Cathartics affect not only the bowels but parts at a distance. Every portion, indeed, of the organism is capable of being impressed by them. They are amongst the most generally useful, and applicable revulsives, which we possess; and, when given to such an extent as to cause hypercatharsis, they rapidly reduce the powers of the system,—less, perhaps, by the copious exhalation of the serous portions of the blood, which they cause from

the lining membrane of the intestines, than by the sympathy that exists between them and the vital organs, which are supplied from the same great system of nerves—the ganglionic. I have referred more than once to the destructive influence exerted on those organs by irritation—often unmarked by prominent symptoms—in the intestinal tube. It is by their mixed depletive and revulsive action that they become useful sorbefacients in hydroptic affections, and we often see cases of rapid disappearance of dropsical effusions under their operation.

Cathartics differ greatly from each other in their mode of operating. Some gripe much; others not at all. Some operate many times; others, rarely more than once; although a good deal, in this respect, depends upon the individual. Pharmacologists have generally divided them,—according to the intensity of their operation,—into ‘laxatives,’ ‘purgatives,’ and ‘drastics,’ under which all the articles may be arranged. To these may be appended another division—that of ‘enemata.’ The ancient humorists, who considered, that most diseases were produced by the predominance of some particular humor, which needed evacuation, and that particular cathartics were eminently endowed with the power of fulfilling these objects, divided them into ‘hydragogues,’ ‘phlegmagogues,’ ‘cholagogues,’ and ‘pantagogues’ or ‘panchynagogues,’ according as their operation was exerted more especially upon the watery portions of the blood, on phlegm, bile, or on the whole of the secretions from the tube collectively.

The division of cathartics into ‘laxatives,’ and ‘purgatives,’ is convenient, and not inappropriate. Laxatives gently stimulate the mucous coat of the intestines, and augment but little the peristole; hence, they are well adapted for cases, in which the sole indication is to unload the bowels of their contents. Some of them produce their effects entirely in a mechanical manner. Corn bread for example, proves laxative to many when they commence its use, in consequence of the mechanical attrition of the particles of the husk left mixed with it. In the same manner, bread, made of unbolted flour, is laxative, and therefore becomes proper in the way of diet, when there is torpor of the digestive function, and hence it has attained the name, with some, of ‘dyspeptic bread.’ Other laxatives, again, are specific local stimulants, or affect the mucous membrane by their medicinal properties,—as sulphur, magnesia, &c. These, when given in a much larger dose than usual, may still be but laxatives. They

do not induce full catharsis ; and are, therefore, separable, with propriety, from the division of purgatives, many of which cannot, in the most minute dose practicable, be made to act as laxatives.

Purgatives produce their effects like laxatives, but their operation is more powerful. They excite a more copious exhalation from the mucous lining of the intestines, and augment the peristaltic action to a greater degree. It is in consequence of the evacuation of watery matters, produced by the operation of purgatives, that they are used as depletives in febrile, and inflammatory affections; and, from the excitation they occasion in the abdominal nerves, they are energetic revulsives. This excitation is often shewn in the tormina and irritation, that precede and accompany their action.

The more violent purgatives have been termed 'drastics.' They produce a greater degree of irritation in the lining membrane of the intestines, and occasionally irritate the nerves of the stomach so much as to induce nausea, and even vomiting. They belong generally to the resinous or resino-extractive substances, and one reason, why they excite such violent tormina, appears to be, that they are sparingly soluble, and adhere to the mucous coat, from which they are but tardily detached. This view is corroborated by the circumstance, that if we add any substance to them, which aids their solubility, the griping may be prevented, or considerably mitigated.

After all, however, although the division of cathartics into laxatives and purgatives is, as I have said, generally convenient, and not inappropriate, the remark is liable to exceptions. So much depends upon the individual, that a laxative may be found to purge drastically; whilst a drastic may scarcely purge at all. Still, these are but exceptions.

Cathartics usually produce their full effect without being absorbed; they are altogether local stimulants to the mucous membrane of the intestines, and, through it, to the muscular coat. Yet, they can act by the way of the circulation, and the fact is another instance of the singular preference, exerted by certain medicinal agents for certain parts of the organism, rather than for others.

When Dr. Hale, of Boston,* injected castor oil into his veins, he speedily felt an oily taste in his mouth, which continued for

* See 'Boylston Medical Prize Dissertations, for the years 1819 and 1821.'

a length of time, and the medicine acted powerfully as a cathartic. Croton oil, when placed on the tongue of an apoplectic, in whom deglutition is impracticable, produces its ordinary cathartic operation. Rhubarb exerts the same agency when applied to the skin; and the milk of a nurse, who has taken infusion of senna, rhubarb or other cathartics, may act upon the intestinal canal of the child.*

As a general rule, the action of cathartics is in a direct ratio with the dose in which they are administered. Some, however, are so active, that it is almost impracticable to reduce them to the point at which they are simple laxatives. Elaterium is one of those. On the other hand, there are agents, whose operation is altogether so gentle, that, if given to any amount, they will not be drastics. Such is the case with manna, magnesia, sugar, and olive oil. Their operation is always that of gentle cathartics or laxatives. There are some substances, again, of this class, whose operation in a full dose is more violent than that which is considered to characterize the action of laxatives, and which, when given in a much larger dose, exert no more energy. Such is the fact with calomel, castor oil, and rhubarb. The effect of these cathartics is generally, indeed, but little understood, or, if understood, but little attended to. I have generally found, that a teaspoonful or two of castor oil has been sufficient to evacuate the bowels, not only in health, but in chronic febrile and other irritations,—where the object has been simply to produce such evacuation. Exceptions, indeed, occur to this, but the rule is not the less general; and it is important to bear it in mind, inasmuch as the stomach is often extremely irritable, and but little adapted for the reception of a greater quantity of indigestible oleaginous matter. When given in these small doses, it is one of the best cathartics we possess for keeping the alimentary canal clear, whenever there is irritation of the gastro-enteric mucous membrane.

I have before alluded to the fact, that the purgative effect of calomel is not necessarily augmented in a direct ratio with an increase of the dose; and that, on the other hand, a small dose will often act as a cathartic, whilst a large one has no such effect. It need scarcely be said, that in all cases, a small dose is, *cæteris paribus*, preferable to a large—if, for no other reason—on the score of economy; whilst the castor oil, as we have seen, when taken

* See the Author's 'Human Physiology,' First Edit. ii. 399; and Second Edit. ii. 373.

in considerable quantity, is well calculated to produce gastric derangement: and rhubarb, and other woody matters, in consequence of the insoluble lignin they contain, are liable to the like objections.

Substances, when largely divided, and made to come into gradual and successive contact with the lining membrane of the digestive tube, generally act with more efficiency, than when given in such form, that the whole cathartic touches in bulk the surface on which it has to act. Thus, an ounce of the sulphate of magnesia, dissolved in half a pint of water, and taken by teaspoonfuls, at short intervals, will induce a much greater action than if the whole solution were swallowed at once. This fact is elucidated by a case, which the late Dr. James Gregory, of Edinburgh, was in the habit of relating in his lectures. A boy was directed to take an ounce of Epsom salts, but, having a strong objection to the taste of the cathartic, he resolved to form it into pills with crumb of bread. On making the pills of an appropriate size, he found they amounted to three hundred and sixty, a number so near to that of the days of the year, that he determined to make it correspond. Accordingly, he divided them into three hundred and sixty-five portions, and took them one after the other. The effect was extraordinary. The most violent hypercatharsis was induced, so as to endanger his life. This was owing probably to the gradual and successive breaking down of the pills, so that particle after particle came in contact with the mucous membrane, and exerted its specific effect.

We can thus understand, that a saline cathartic, dissolved in a large quantity of water, may act more powerfully than if the quantity of the solvent were less. In many of the saline mineral waters, which are employed as cathartics, the quantity of saline ingredient is extremely small. A pint of the Seltzer water contains but five grains of the carbonate of magnesia and seventeen of the chloride of sodium. The same measure of Spa water contains nine and a half grains, and one quarter of a grain of the chloride of sodium. The Aix-la-Chapelle water has five grains of the chloride of sodium, to the pint; the Balston, five grains of carbonate of magnesia; and eighteen of the chloride of sodium; the Bedford, one and a half grain of the chloride of sodium, and ten grains of the sulphate of magnesia; and the congress spring, at Saratoga, twelve grains of the carbonate of magnesia, and forty-eight grains of the chloride of sodium.

Many of the resinous purgatives excite much griping during

their operation,—apparently by adhering to the mucous lining, and acting as violent irritants; hence ‘corrigents’ are required to remove the disagreeable accompaniments of their ordinary operation. These may consist,—either of substances, which add to their solubility;—of agents, which, by augmenting the peristole of the canal, hurry on the cathartic, so that it does not remain, for any length of time, in contact with any one portion of the mucous membrane;—or of such as shield the intestinal canal against their irritating influence.

As a general rule, the soluble cathartics act more speedily than the others; yet, the cathartic oils are exceptions to this, for they are scarcely, if at all, soluble,—undergoing little or no change in the stomach. Castor oil, when taken, becomes mixed with the alkaline and other secretions, and substances in the alimentary canal, and is divided into small filaments, so as occasionally to deceive the practitioner. Some years ago, J. P. Frank was requested to see a prince, who had been attacked with epilepsy. His physician, a respectable old practitioner, assured Frank, that he could at pleasure make his patient void thousands of filiform worms. As he was neither able to define the genus, nor species of these worms, the quantity of which, from his account, seemed to be prodigious, Frank requested to be a witness of the phenomenon. The physician administered a dose of castor oil, which produced several evacuations, in which were thousands of whitish filaments resembling small eels; but, on an attentive examination, these supposed worms were found to consist entirely of castor oil, divided in the manner I have mentioned.

Owing to the fact, that—as a general rule—soluble cathartics act sooner than those that are less so, we can understand, that mixtures may operate more speedily than pills; that saline cathartics may act more freely if we allow liquids to be taken during their operation, and that the resinous cathartics may be longer in operating than the saline. It has been attempted—but not with complete success—to shew, that this fact may account for certain purgatives acting more upon one part of the intestinal canal, than upon another.

When demulcients are given along with acrid purgatives, they moderate the violence of their action, by shielding the mucous surface, so as to diminish the local stimulation. In the same way, narcotics lessen the impressibility of the nervous system, and thereby diminish the operation of cathartics, but it will be easily seen, that if much spasm exist in the intestinal canal, they

may aid the operation. Suppose, for example, a state of constipation, accompanied with violent colic pains, but without enteric inflammation; the combination of a full dose of an opiate with a cathartic will allay the spasm, and induce catharsis in the most happy manner. Indeed, where enteric inflammation does exist—especially if copious bloodletting have been premised—such a union of sedative and cathartic is often succeeded by the most beneficial results. The different varieties of colic are, by many intelligent practitioners, treated almost wholly by a combination of calomel with opium.

It is obvious, that if our desire be simply to evacuate the bowels, without heeding the revulsive effect, which cathartics are capable of inducing, the rapid purgatives and forms of administration are to be chosen;—such as castor oil, and the various saline substances; but, where habitual constipation exists, it is not always advisable to administer these agents, in such doses as to act violently. A cathartic removes the contents of the canal, but it does not obviate the pathological condition, which gives rise to the constipation. On the contrary, in accordance with the laws of compensation, which we observe to prevail so extensively in the animal economy, we find, that the tendency to constipation is augmented after its operation,—diminished action of the exhalants of the mucous membrane, and of the muscular coat succeeding the exaltation of the vital manifestations, produced in these tissues by the operation of the cathartic; hence, it happens, that if cathartics be had recourse to, in habits disposed to constipation, whenever this state exists, the person, in time, demands so imperiously the stimulation they excite, that he is unable to have an evacuation without them. This result is more liable to supervene after the action of certain purgatives than of others. Castor oil, and croton oil are more exempt from it than the other cathartics, whilst rhubarb is generally esteemed more obnoxious to the remark than any of the class.

The best mode of obviating this tendency to constipation is, to avoid the exhibition of cathartics, which powerfully excite the organs directly and indirectly concerned in defecation, and to trust altogether to the employment of laxatives, and an appropriate regimen. The best laxatives, for such purpose, are those, that affect the whole extent of the canal, and which possess the property of developing its impressibility. Such, we have seen, is the operation of the saline cathartics. A good preparation of this kind is a mixture, formed by pouring a quart of boiling wa-

ter on an ounce of the sulphate of magnesia, mixed with one drachm of the bitartrate of potassa, and directing the patient to take a wineglassful of the solution every night and morning, until the bowels are made to respond properly. The bitartrate of potassa is laxative, whilst its acid character masks the disagreeable taste of the sulphate of magnesia; and the combination rarely fails to restore the intestinal functions to their due condition; but it is occasionally necessary to persevere in the use of the remedy for some weeks before the full beneficial results are obtained. I have recently had a marked case of the good effects of this agent, on a gentleman, who was unable to have an evacuation without the use of rhubarb, of which he was compelled to chew a considerable quantity daily. The habit was broken in upon, and the bowels restored to their proper action, by the use of the saline solution, but no decided benefit was derived, until it had been persevered in for some time.

It is easy to conceive, that cathartics, which simply evacuate the contents of the bowels, may be more demanded in warm climates and seasons than in cold, in consequence of the erethism of the mucous membrane of the alimentary tube, which prevails so much during great atmospheric heat; yet, owing to this very erethism, as well as to the greater degree of sensibility of the nervous system, generally induced by atmospheric heat, drastic cathartics may have to be used with more caution.

The abuse of purgatives occasions great exaltation of the sensibility of the digestive tube. I have already referred to this circumstance, as connected with the abuse of emetics, and the remarks, made on that occasion, are equally applicable to the effects of the class of medicinal agents, which we are now considering. Broussais observes, in the commentary to his 155th proposition, that he has frequent opportunities for witnessing this effect in persons, who have taken the purgative of Le Roy, in the manner directed by that empiric,—that is, for several days in succession. So much irritability of the digestive apparatus has been caused, that it has been impossible to restore the equilibrium of action. “In them, digestion, defecation, and even the simple passage of matters into the small intestine are painful; many very uneasy and singular sensations accompany the slightest efforts of the muscles of the stomach and intestines, and are felt not only in the abdomen, but in every part in which the cerebral nerves predominate. A most unpleasant buzzing in the ears is the first consequence of these imprudent medications; to

this, various pains in the head are soon added, with weight and fulness of the eyelids; tenderness of the limbs, joints, and periosteum, and of a portion of the skin, with often an inexpressible uneasiness, the seat of which cannot be assigned to any particular part. Almost every kind of motion becomes painful at certain periods of digestion; but as these pains are not always referred to the exact portion of the stomach or bowels with which the food is in contact, as most commonly the ingestion of food is followed by a feeling of health, which causes a momentary oblivion of all suffering, the patients accustom themselves to associate the idea of improvement with that of agreeable food or drink, and make the sum of their evils an entity (disease) for which tonics are the true remedies."

Although it often happens, that all these signs of mischief are occasionally produced by the abuse of cathartics, they rarely perhaps present themselves, in conjunction, in the same individuals. At the present day, indeed, such abuse is by no means so common as it was half a century ago; the folly of keeping up a perpetual irritation of the lining membrane of the intestines, in diseases, often themselves arising from irritation in this very part of the organism, having become appreciated. It need hardly be added, that whenever such irritation or active inflammation is shewn to exist in the membrane, the operation of drastic cathartics, or of ordinary purgatives, may be contra-indicated, although it may still be all-important to preserve the tube free from morbid secretions—which cannot fail to be thrown out in such a state of the membrane—as well as from extraneous matters taken as aliment, which, under febrile heat, might be likely to undergo morbid changes. It has often fallen to my lot to witness the bad effects, resulting from the administration of active cathartics, in cases of fever—of the typhoid kind especially—in which the powers of the system have been worn down by the irritation resulting from the specific action of the medicine, and the exhaustion caused by the repeated evacuations.

During gestation, violent cathartics must be used with caution, as well as during menstruation; and those cathartics, whose action is exerted by preference on the lower part of the intestinal canal, require special caution in their administration. For this reason, purgatives of the aloetic kind are avoided, unless their operation is tempered by the addition of some substance, as soap, which, by adding to their solubility, diffuses their action over a larger surface of the alimentary canal; or, by the addition of

some narcotic, as hyoscyamus, which renders their operation less irritating. Most of the abortives, employed with a criminal intent, belong to this class of drugs;—their primary operation being exerted on the intestinal canal, and the uterus becoming affected by contiguous sympathy.

A selection of cathartics may be made, to a certain extent, to suit the age of the individual. In very young infants, the milder cathartics are employed,—as castor oil; magnesia; or rhubarb,—combined or not with magnesia. Generally, during early childhood, there is a great predominance of acidity, so that absorbent laxatives become especially indicated; hence it is, that magnesia is in such common use. Calomel is also much given during the first periods of life, owing to the facility with which it can be administered. In old age, the warmer resinous cathartics are usually employed, and these are generally given in the form of pill.

In referring to the influence of the *moral* over the *physique*, I had occasion to remark, that, under particular emotions, some of the excretory functions are acted upon, and, amongst these, those concerned in defecation. Anxious dread, or excessive fear has this effect in a marked manner; and it has been probably experienced by every one under such circumstances. Certain emotions may, therefore, be looked upon as ‘mental cathartics,’ although, as such, not capable of being invoked in the treatment of disease.

In the administration of cathartics, some choice as to time can occasionally be indulged. For example, if the pilular form be chosen, and substances difficult of solution be selected, they may be taken at bedtime. Accordingly, pills of calomel—to be followed afterwards by a saline or other soluble cathartic—are directed to be taken at the time of retiring to rest. On the other hand, saline aperients, castor oil, &c., are generally given in the morning, their operation being more speedy, and therefore more likely to disturb the patient, if administered at night. Very early in the morning, when the stomach is entirely empty, a small dose of a cathartic will operate as speedily, and effectually as a much larger taken after breakfast. Of course, when the administration of cathartics is imperiously demanded, in any case, delay is inadmissible, and therefore no opportunity is left for choice of time.

During the action of cathartics, the dermoid system is extremely impressible; and if the patient be exposed to the partial and

irregular application of cold, derangement of capillary action is apt to be induced, and if there be any organ, particularly liable at the time to take on diseased action, it will be apt to do so.

Cathartics may, likewise, be exhibited to act on the lower part of the intestinal tube by direct application. In this form, they are termed cathartic 'glysters,' *enemata* or *lavemens*. When thrown in contact with the lining membrane of the rectum they irritate it; and, by sympathy of continuity, their influence is extended to the upper portion of the tube. Hence, they may be administered with advantage, when cathartics cannot be easily given by the mouth, as where deglutition is impracticable. Accordingly, in apoplexy, trismus, &c., this is a mode of exhibiting purgative and other remedies often had recourse to. It is obvious, too, that glysters may be given with advantage to aid the operation of cathartics; and, in cases of extreme debility, in which apprehension is entertained, that cathartics, administered in the ordinary mode, may act too powerfully, glysters can be advantageously substituted. They are, indeed, most valuable agents, and, until of late, have been too little employed in this country, as well as in Great Britain; but, on the continent of Europe, they form a part of the *boudoir* of every female, and are regarded indispensable to cleanliness and to health. In the *Malade Imaginaire* of the inimitable Molière, Argan enters on the stage, reading his apothecary's bill,—in which the clyster and its adaptation occur over and over again,—without any feeling arising of outraged delicacy; whilst with us the slightest allusion to the operation or the instrument cannot be mentioned to ears polite.

Even cold water, when thrown into the rectum, excites the peristole of the intestines, and produces a very salutary effect in inflammation of the lining membrane;—the cooling influence being propagated elsewhere, by virtue of the extensive sympathy, that exists between every part of the capillary surface. In the same manner, warmth can be applied so as not only to act as a fermentation to the parts with which the material of the glyster comes in contact, but to have the soothing effect extended to parts higher up: and, by means of contiguous sympathy, to organs seated in the vicinity of the lower portions of the tube. With both these views enemata are administered, but they are chiefly used for the purpose of specifically stimulating the canal, so as to occasion the evacuation of its contents. For this purpose, salt and water, or molasses and water, or gruel with the addition of salt or castor oil, are generally the selected vehicles;

and if the desire be, to excite considerable revulsion in the rectum, the oil of turpentine may be added, either formed into an emulsion with the yolk of egg, or simply mixed with the gruel or other constituents of the enema. At times, where the idea exists, that constipation is the effect of spasm in some part of the canal, the tobacco glyster is administered. This may be given either in the way of infusion or of smoke, which latter may be thrown up through an ordinary tobacco-pipe;—the tobacco being placed in the bulb. It is then ignited, and the bulb being put into the mouth, the smoke can be readily forced into the intestinal canal, by blowing through the tube. The exhibition of tobacco, in either mode, is attended, however, with danger, and therefore it ought not to be invoked except with great caution. Cases are on record of fatal results from an infusion of the strength directed in the pharmacopœias, which is one drachm of the leaves to a pint of boiling water.

When glysters are administered by the ordinary bag and pipe, they rarely go farther than the rectum, and therefore, at times, fail altogether in their operation. The syringe, employed of recent date, is capable of propelling the enema farther; but, at times, it also fails, especially where there is any thing like spasmodic action at the termination of the sigmoid flexure of the colon, as is not unfrequently the case. Dr. O'Beirne has very properly directed the attention of the physician to this point in the pathology of defecation, and has advised, that an elastic gum tube, like the ordinary stomach tube, should be gently insinuated through the narrow portion at the sigmoid flexure, until it has completely entered the colon; in this way liquid feces or flatus are occasionally brought away after every ordinary remedy has failed; and it is obvious, that by attaching the external extremity of the tube to the stomach pump, an enema may be projected into the colon, and prove effectual, when the ordinary enemata, as usually exhibited, have been administered in vain.*

Some years ago, before the appearance of Dr. O'Beirne's observations, I had an interesting case of obstruction of the bowels, in an aged individual, who, for almost the whole period of his existence, had held an honorable situation in his country's service. In this case, the colon appeared to be much distended by flatus. Injection after injection was thrown up by the only means at hand—the bag and pipe—but no relief was obtained.

* See the Author's 'Human Physiology,' Second Edit. i. 532.

Indeed, the symptoms became more and more urgent. Under these circumstances, the idea struck me, that if I could pass up a hollow instrument, until it attained the part of the colon above the seat of the constriction, relief might be obtained. Accordingly, a large sized elastic gum male catheter was passed, with some difficulty, through the sigmoid flexure, and as soon as its extremity attained the gut, a considerable discharge of fetid gas took place, and relief was instantaneous. This agency would probably be completely successful in affording relief, in those cases in which it has been recently advised to force air into the intestines for the removal of colic occasioned by the presence of air in the intestines ;—a plan of treatment, by the way, which is minutely described by Swift, and the invention assigned to a medical philosopher of the Academy of Lagado !

The quantity of fluid, to be administered in the way of enema, must vary according to age, and other circumstances. For an infant, a few ounces may be sufficient ; for an adult, from a pint to a quart ; but if the desire be to wash out the colon, a considerable quantity may be necessary. In all cases, when given to produce a cathartic operation, the fluid ought not to be thrown up too rapidly, as it is apt to excite the rectum so as to occasion its immediate return, bringing along with it only the contents of that gut. The enema ought to stay long enough to excite, by sympathy, the whole tract of the large intestines at least ; and, therefore, if it comes away in a few minutes—and especially if the discharge has but little fæcal matter mixed with it—it ought to be repeated.

I have already remarked, that glysters are excellent revulsives, when composed of materials possessed of excitant properties. The same may be said of 'suppositories,' which may be special excitants, or simple excitants, according to the ingredients of which they are composed. In early infancy, they are often employed to open the bowels, and are usually composed of turpentine soap,—a small conical piece of this soap, moistened, being forced up into the rectum, and left there, when it generally produces a free evacuation of the lower part of the canal. Sometimes, the soap is smeared over with castor oil ; at other times, with turpentine, to add to the cathartic effect. In this way, as well as by glyster, any medicinal agent may be brought to affect the rectum ; and accordingly, cathartics, opiates, &c., are often so administered.

Of late, it has been proposed to introduce a kind of galvanic suppository, made of two metals—zinc and copper—into the

rectum, for the removal of constipation, and this has been attended, in some cases, with good effects; not, probably, in consequence of any specific excitation of the nerves of the rectum, by the galvanic fluid, but by its acting as an excitant to the nerves of the mucous membrane.

Another mode of employing the galvanic excitation is by forming a connection between two different metals; one being introduced into the mouth; the other into the rectum; but this apparatus is not possessed of more energy than the first, and both are perhaps largely indebted for their action to the local excitation, which their presence in the rectum engenders. The public and even the profession have been amused by various instruments, invented for the application of galvanism to different parts of the body; and if their efficacy on the frame has not been well marked, they have not failed to minister to the pockets of their inventors.

Dr. Thomson* remarks, that the peristaltic action of the intestines may be increased by various external means; and, of these, he instances the electrical aura as highly useful in 'simple torpor of the gut;' and the dashing of cold water on the lower extremities, which has succeeded in procuring the immediate evacuation of the intestines "in obstinate costiveness, particularly in the case of ileus, when all other means have failed." Both these agents produce their effect less as special excitants, than by modifying the nervous distribution. We have already seen, that there are many nervous modifications,—those of the mind especially,—which act upon the intestinal canal, so as to produce catharsis.

The Therapeutical application of cathartics will now be readily intelligible. There is no class of remedial agents so often had recourse to,—none so often irrationally used. They may, of course, be employed with various objects:—either to act as simple evacuants, as depleting agents, or as revulsives.

In the disordered action of functions, constituting general fever—whatever may be the variety of that fever—their use is, throughout the disease, more or less indicated. In the state of erethism that exists in every portion of the dermoid structure,

* *Op. citat. ii. 358.*

morbid secretions are necessarily formed, which, if not removed, act as fomites and induce much irritation: yet although cathartics of a mild kind are needed to keep the intestinal canal free, it is—as has been before observed—a great mistake to irritate the lining membrane of the intestines by drastics, in diseased conditions in which the absence of all irritation—mental as well as corporeal—ought to be inculcated, and this remark applies especially to fevers, which are liable to be accompanied by unusual irritation in the mucous membrane of the stomach, and small intestines. The plan, to be pursued in such cases, seems to be clearly indicated,—to attack the local inflammation, and the general increased action, by bleeding—general and local—and by the use of refrigerants; to keep the canal free by cathartics of the mildest kind,—as a teaspoonful of the *oleum ricini*, repeated at intervals if necessary,—and, under this system, the issue is, according to my experience, far more fortunate than where much irritation is kept up in the intestinal canal. Reflection, indeed, suggests, at a glance, the impropriety and inconsistency of any irritating plan of medication. We carefully employ sedative agents; we recommend the most careful abstraction of light, and sound, and the avoidance of all irritation, *except*, that which we officially excite in a part of the system, which, as Broussais has properly maintained, possesses intimate sympathetic relations with every other part of the organism; and, under this mode of management—I am satisfied—many cases of continued and remittent fever run their course to a fatal termination, which, under a better system of treatment, would have terminated in health. Recollect, that, in these cases, the objection is not to cathartics in the abstract. I regard the employment of mild cathartics, to keep the alimentary tube entirely free from all morbid secretions, as one of the most important points in the management of fevers, that are even accompanied with an unusual degree of erethism of the gastro-enteric mucous membrane. It is the powerfully irritating cathartic—that excites evacuation after evacuation, and exhausts the patient by irritation—which is so highly objectionable. Many cases of continued and remittent fever have arrived at a happy termination by the treatment I have recommended, which, it appeared to me, might have eventuated unfortunately, had the irritating cathartic agency, so strongly inculcated by several distinguished teachers and authors, within so late a period as the last fifty years, been adopted. If we cast our eyes over the periodicals, which are emanating from

the press, we find, that such agency is beginning to be less and less invoked, although the attention of the practitioner is equally directed to the gentle removal of all offending matters from the intestinal canal. Laxatives, or gentle cathartics—in other words—have taken the place of the more violent, and the improvement has been signal.

In fevers of the synochal or highly inflammatory kind, unaccompanied with much gastro-enteric irritation, more powerful cathartics may be employed, our object being to use them as depleting agents, as well as for the purpose of evacuating offending matters. In such cases, we have recourse, more commonly, to saline cathartics, which, by exciting the action of the exhalants of the mucous membrane generally, occasion the evacuation of a considerable portion of the more watery parts of the blood.

It has been generally inculcated, that whenever the evacuations are fetid or ill-conditioned, it is necessary, that catharsis after catharsis should be induced, until their natural healthy character is restored; but if the alimentary canal be kept clear from the commencement of, and throughout, the disease, it will rarely happen, that this fetid character will be marked, or to such an extent as to demand much attention. Besides, we have to bear in mind, that they may be rendered ill-conditioned by the employment of these very agents. When calomel is exhibited for some time, it modifies the secretion from the different glandular and follicular organs, and gives occasion, as before mentioned, to green or dark colored evacuations, very much resembling chopped spinach. This has, of course, to be borne in mind, as under the idea just mentioned, and which prevails largely amongst those who do not reflect, the cathartic might be repeated, dose after dose, with the view of removing the very condition it has induced.

Professor Chapman has recommended, that, in obstinate remittent and intermittent autumnal fevers, cathartics should be continued until dark, tarry, fetid stools are induced. This dark appearance, he conceives to be a glutinous matter, which adheres to the intestines, and requires cathartics for its removal; but it appears by no means clear, that it may not be, in part, the effect of the repeated employment of cathartics deteriorating the intestinal secretions, in the manner just referred to.

From what has already been said, it will obviously be improper to administer violent cathartics in yellow fever; which is a

remittent, accompanied by, if not dependent upon, malignant gastritis or gastro-enteritis.

In intermittents, cathartics are rarely employed for cutting short the disease. The impression they make upon the nervous system is not sufficiently intense to break in upon the morbid catenation, which constitutes the affection. They are generally employed in such cases, with the view of removing the contents of the alimentary tube, so as to prepare the way for the administration of the cinchona, or of some of its preparations, or of other febrifuges; and, in the progress of the affection, they are had recourse to—as in other maladies—for removing morbid secretions, or whenever the bowels are in such a condition as to require their employment.

In all cases, where a doubt may exist as to the propriety of invoking the use of cathartics, there can be none as to the exhibition of enemata. They are, indeed, invaluable agents, where the powers of life are so much reduced, that a rational fear is entertained as regards the administration of cathartics by the mouth. Even when food has not been taken, the canal must be kept free; as the vitiated secretions, and the product of the digestion of the different substances poured into the digestive tube, cannot fail, by their retention, to add to the irritation.

In all the exanthemata, the employment of gentle cathartics is indispensable to their judicious management. In smallpox, measles, scarlatina, &c.,—where the cutaneous surface is affected with so much erethism,—the extension of the skin, constituting the mucous membranes, and especially the gastro-intestinal, cannot fail to participate in the general pathological condition; to have its secretions depraved; and, consequently, to require the administration of evacuants.

With regard to the kind of cathartics, best adapted for febrile affections in general, there is none perhaps so available as the *oleum ricini*. Next to this, the different salines, especially the sulphate of magnesia; and, if stronger cathartics are required,—which, as we have seen, happens far more rarely than has been imagined—the ‘*pulvis jalapæ compositus*’—which consists of jalap and bitartrate of potassa; or combinations of jalap and calomel, or of rhubarb and calomel, may be administered. Where the object is, as in fever, to remove all offending matters daily from the alimentary canal, and not to excite a powerful re-

vulsion, or a copious exhalation from the mucous membrane, the most unirritating agents ought obviously to be chosen, and, of these, the *oleum ricini* is decidedly the best.

Cases of thoracic inflammation do not exhibit any signal advantage from the employment of cathartics. They can only act by virtue of their depletory or revulsive properties, and their administration must be guided by general principles; but, in inflammatory affections of the contents of the abdomen, or of its lining membrane, great care and discrimination have to be invoked, for the purpose of deciding upon their utility, or the contrary.

In peritonitis, whether implicating the peritoneum proper, or its extensions investing the intestines, cathartics have to be employed with caution, for fear the irritation they excite, during their operation, should add to the inflammation. In such cases, Dr. William Saunders was in the habit of saying, that the best mode of opening the bowels—in enteritis especially, which is usually attended with constipation—was the use of the lancet; and if this be followed up by a full sedative dose of opium, the bowels will often respond without the aid of any cathartic. The constipation is, in such cases, dependent upon the inflammation, and when this—the cause—is removed, the effect yields also. Where the enteritis is seated in the mucous coat, irritating purgatives should be given with extreme caution. A case, indeed, can scarcely be imagined, in which they can be indicated; yet, the exhibition of a gentle cathartic,—simply with the view of keeping the canal free from the morbid secretions, and morbid matters, which cannot fail to be present in such a diseased condition of the lining membrane,—is amongst our most valuable means of medication. This is signally the case in dysentery,—in which the inflammation is chiefly seated in the lower portion of the intestinal tube,—and in the early stages of cholera, common as well as spasmodic.

In diarrhœa which arises from irritation of the lining membrane of the intestines, it was, at one time, the custom to employ no agents of any kind. The disease—as I have already remarked—was looked upon as an effort of nature not to be interfered with; whilst by others, an opposite view has been maintained, and astringents have been advised from the commencement. Of the two views, the latter is more markedly erroneous, and mischiev-

ous, in its consequences. The disease is one of irritation, and the exciting cause is often seated in the intestines themselves: accordingly, as an almost universal rule, it may be maintained, that gentle cathartics should be exhibited in the first instance, and be repeated if necessary; and that astringents should not be used, unless an asthenic condition should supervene,—like the gleet, which generally succeeds to acute inflammation of the other mucous membranes.

If we admit the propriety of the use of gentle cathartics in the case of diarrhœa affecting adults, the remark applies *a fortiori* to the diarrhœa of infants. They are extremely liable to erethism of the dermoid tissue, and to the formation of acid in the primæ viæ, which has often, probably, considerable agency in its development;—hence the acid smell of the evacuations. Often, too, accompanying this state, there are manifest indications of an inflamed condition of the gastro-intestinal mucous membrane.

In the variety of dyspepsia, which consists of an irritated condition of the lining membrane of the stomach, violent cathartics are improper; but laxatives may be,—and usually are,—indicated. Indeed, in atonic dyspepsia, the same system must be adopted, and an occasional brisk cathartic may be exhibited with advantage. When employed in this manner, a fillip is given to the digestive function, which is often most salutary; whilst if the cathartic be often repeated, a degree of sensibility and irritability is apt to be induced in the bowels, which cannot fail to add largely to the mischief.

In hepatic phlegmasia, engorgement, or torpor, cathartics have been regarded as eminently useful, by acting immediately on the portal veins, and thus diminishing the quantity of fluid, that passes to the liver by the vena porta. From what has been remarked, regarding the use of emetics in jaundice, and in cholelithos or gallstone, it will be readily understood, that cathartics may have a beneficial agency, by stimulating the intestinal tube; the excitation being conveyed by continuous sympathy to the liver and its accessaries; but where there is organic mischief, as happens in most of the protracted cases, especially when occurring in those of broken down constitutions, they must be given with caution.

Of the utility of cathartics in constipation we have already

spoken. They ought not to be administered in such doses as to act as powerful local stimulants, on account of the depression, which always succeeds to the superexcitation. The proper mode of administering them is in small doses, often repeated, and accompanying them by a properly regulated diet. A brisk cathartic may obviate the constipation for the time, but no permanent cure can be effected, without striking at the root of the evil, by a proper and protracted laxative treatment, and regimen.

In the different varieties of colic, the appropriate use of cathartics is the best treatment that can be adopted. The intestinal pain, is generally caused by over-distension of the coats by flatus, or by accumulated or irritating aliments; and the method of removing the disease is to excite the peristaltic action of the intestines, so as to diffuse the flatus over a larger surface, or to remove the source of irritation. This can be best effected by a union of cathartics with aromatics, or, when the pain is extremely violent, by the substitution of an opiate for the aromatic, to allay the spasm, which forms a part of the disease.

The rules, that guide us in the administration of cathartics in hemorrhage, will vary according as it is of the active or passive kind. In the former, they may be proper; in the latter not. In apoplexy, we employ them both as depletives, and revulsives; but more for the latter purpose than the former. During the apoplectic seizure, one of the best revulsives we can use is a stimulating enema, and this can be administered when deglutition is impracticable. The croton oil is also given under similar circumstances. If a drop of this be put upon the tongue, it passes by imbibition into the bloodvessels, and seeks out the intestinal canal for its operation, by virtue of that singular action of preference, of which we have so many marked examples.

In the epistaxis, that occurs about the period of puberty, the depletion and revulsion, produced by a common dose of the sulphate of magnesia, is often sufficient to put a stop to it; and, whenever signs of vascular activity exist,—as in other hemorrhages,—cathartics will be clearly suggested. The same may be said of their employment in cases of hæmoptysis, although mental and corporeal quiet are absolutely necessary during the attack, and for some time afterwards; but, in the interval, no doubt can arise as to the propriety of their administration. The

saline cathartics, which operate upon the whole of the intestinal canal, and augment the exhalation from the mucous membrane, ought perhaps to be selected.

In hæmatemesis or vomiting of blood, whilst cathartics have been strongly recommended by some, they have been as warmly reprobated by others. The German practitioners generally object to them; yet the objection does not appear to be well founded. A saline cathartic, by acting upon the whole of the intestinal canal, developes a succession of sympathies, during its operation, that derives greatly from the concentration of vital activity towards the stomach, which is present in active hæmatemesis. Besides, certain of the saline preparations,—as I have before shewn,—are somewhat astringent: the bisulphate or supersulphate of magnesia, potassa, or soda, for example,—which may be formed extemporaneously, by adding the elixir of vitriol, or the dilute sulphuric acid, to a solution of the sulphate of magnesia, the sulphate of soda, or the sulphate of potassa—comes in contact with the vessels pouring out the blood by rhexis or diapedesis, and by its directly astringent properties, arrests the hemorrhage, whilst the agency of the cathartic may prevent its recurrence. I have elsewhere remarked, that many cases of hæmatemesis are dependent upon obstruction in some other organ than the stomach,—and especially in the uterus; and, where there is torpor of this last viscus—such as exists in many, if not in most, cases of amenorrhœa—the action of the cathartic is well adapted for communicating a salutary excitation to the uterine functions, through contiguous sympathy.

In menorrhagia, care has to be taken in the administration of cathartics, owing to the fact just mentioned,—that they excite the action of the uterus by the sympathy of contiguity; but, in hæmaturia, such cathartics may be beneficially employed as are not accompanied with a diuretic operation,—the derivation of nervous and vascular influx from the urinary organs being attended with the best effects. With this view, the oleum ricini is often had recourse to, with much advantage.

In hemorrhoids, the mildest kinds of cathartics are serviceable, whilst the more violent are injurious. Obviously, too, such cathartics should be avoided as act upon the lower portion of the alimentary tube, unless some addition be made to them, which

robs them of their objectionable features. Accordingly, when aloes is given, it is generally in small doses, and with the addition of some narcotic,—as hyoscyamus. Calomel is a cathartic, which generally acts more energetically upon the upper portion of the intestines ; but, with some, it strongly irritates the rectum, and, consequently, such individuals should avoid its use, when affected with hemorrhoids or any disease of the rectum. Castor oil, and sulphur are the best laxatives in such cases. These remarks apply equally to procidentia ani, in which drastic cathartics could not fail to do mischief. In pregnancy, too, they must be avoided, for reasons that have been previously assigned.

In the various head affections, and especially in encephalitis,—whether involving the brain or its membranes, or both,—cathartics would clearly be advantageous, by virtue of the revulsion they effect, did not the inconveniences, to which the patient is subjected by the motion necessarily attendant on their operation, often preclude their employment.

In mania, cathartics are, at times, absolutely required, in consequence of the torpor, that occasionally exists in the intestinal tube. Owing to this cause, an accumulation sometimes takes place in the large intestines to a surprising extent, and the use of the scoop, is required to remove the indurated fæces that have collected in the rectum ; after which, injections of cold water may be thrown into the large intestine to restore its tone.

Owing to the torpor of the nerves of the tube, or rather, to the cerebral abstraction and excitation, which prevent the usual sensitive impressions from being duly appreciated, the most violent drastics are occasionally demanded—as the *oleum tigllii*, or the elaterium,—and even these are often ineffectual, unless bloodletting be premised, which, by reducing the nervous energy, enables smaller doses to produce the wished-for operation. Sometimes, considerable difficulty is experienced in the administration of any remedy by the mouth,—the patient obstinately closing the jaws, and resisting every effort to separate them. This determination may frequently, however, be broken in upon—especially after bloodletting—by pressing strongly on the parotid gland, which occasions so much pain, that the maniac yields, and the jaw is depressed.

In all the neuroses, it is important to keep the intestinal tube free; as irritations, seated there, react upon the cerebro-spinal axis, and add to the mischief.

Hysteria, which is ranked, though improperly, by Pinel, in accordance with antiquated notions, as a *névrose de la generation*, is often associated with this condition of the bowels; and therefore requires the use of cathartics. Great nervous torpor of the whole system is also present in many cases of this protean malady, requiring the administration of cathartics as revulsives, both by the mouth, and rectum.

Under the head of emetics it was remarked, that irritations of the stomach and bowels, produced by improper diet or by morbid secretions, are a grand exciting cause of epilepsy, as well as of infantile convulsions. Cathartics are, therefore, almost universally proper in these alarming attacks; but care must be taken not to repeat them sufficiently often to develope much sensibility of the tube, as they might react on the cerebro-spinal axis, and augment the very mischief they were administered to remove.

Chorea—a disease of the nervous centres, accompanied with great torpor of the digestive function,—requires a union of tonics with cathartics for its removal. Dr. Hamilton, of Edinburgh,—an authority, who has been the cause of much valuable use, and, at the same time, of much abuse of the cathartic medication—places his main reliance on cathartics, in the cure of this singular affection.

One of the varieties of trismus—the trismus nascentium—or lockjaw of the new-born, is often dependent upon irritations seated in the intestinal canal, and is occasionally removable by gentle cathartics, as the oleum ricini. In this part of the globe, it is rarely witnessed; but, in the warmer regions, it is a fatal malady. At the Havana, according to my friend, Don Ramon de la Sagra, of one hundred children, dying under ten years of age, nineteen per cent. amongst the whites, die within the first seven days, and twenty-four per cent. amongst the infants of color. There, the affection is called the ‘disease of the seven days’ (*mal de los siete dias.*)*

* Historia economico-politica y estadistica de la Isla de Cuba, etc. etc. Habana, 1831, p. 66.

In violent cases, of tetanus, in the adult, cathartics constitute one of the agents to which recourse is almost invariably had, along with other, and more essential remedies,—as narcotics. When swallowing is impracticable, stimulating enemata are often administered, with the view of exciting a new impression by revulsion ; or opium is given in the same manner, where the object of the practitioner is to endeavour to overpower, by sedatives, the inordinate erethism of the cerebro-spinal axis. When deglutition can be effected, a union of cathartics and opiates is often invoked, for the fulfilment of similar views. The *oleum tiglii* is, in these cases, a useful cathartic, both when deglutition exists, and when it is impracticable.

Cathartics are amongst our most valued, and valuable agents in the treatment of dropsies, especially when these are of an active kind. In the passive, they must necessarily be used with more caution. The division of cathartics, to which we have recourse, is that of drastics—and such of those especially as produce copious watery discharges,—or, in other words, act powerfully on the secretory apparatus of the mucous membrane of the alimentary canal. *Elatarium* is one ; but it must be cautiously administered, on account of the difficulty, that exists in regulating its operation. Calomel, and gamboge are often selected for this agency. These hydragogues—as before mentioned—act in two ways, in the curation of dropsy. They diminish the amount of circulating fluid, and thus add to the activity of imbibition ; and they excite a powerful revulsion, which gives rise, indirectly, to a sorbefacient agency.

Lastly. Cathartics are often employed as anthelmintics ; but their main effect can only be the removal of existing worms ; they do not prevent their re-formation ; besides, if often given, they may debilitate the system generally, and the digestive function in particular, and thus favour the predisposition to the development of those parasites ; but, on the other hand, an occasional brisk cathartic may give tone, rather than detract from it, by breaking in upon the monotonous execution of functions, and exerting a salutary impression of excitation.

Such are the chief disorders and purposes, for which cathartics are administered. It is obviously almost as impracticable, as it is unnecessary, to refer to every case, in which their em-

ployment may seem to be indicated. Their main effects on the general system are,—depletion and revulsion; and a wise discrimination will suggest the particular cases, in which such agency is demanded. Their immediate effects upon the parts with which they come in contact are obvious; and a very slight degree of reflection—after the pathological lesion has been correctly appreciated—will enable the practitioner to decide as to their admissibility.

TABLE

OF THE CHIEF CATHARTICS, AND THEIR OFFICINAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Aloe. <i>Aloes.</i> (The extract of the <i>Aloe Spicata.</i>)	From Southern Africa.	.....	gr. 5 to 15.
(The <i>Barbadoes Aloes</i> is from the <i>Aloe Vulgaris.</i>)			
	From the West Indies.	Decoctum Aloes compositum. (Eq. glycyrrh. oz. $\frac{1}{4}$; potass. subcarb. ser. 2; aloes in pulv. myrrh in pulv. croci ana dr. 1; tinct. cardam. c. f. oz. 4; aq. O j. Boil to f. oz. 12, and add the tincture of cardamoms.)	f. oz. $\frac{1}{2}$ to f. oz. 3
		Pilulæ Aloes. (Aloes, sapon. ana oz. 1; divide in pilulas 240.)	No. 1, 2 or 3.
		Pilulæ Aloes compositæ. (Aloes oz. 1; ext. gentian oz. $\frac{1}{8}$; ol. carui m 60; syrup. q. s.)	gr. 5 to 20.
		Pilulæ aloes et assafœtidæ. (Aloes, assafœtid. sapon. ana oz. $\frac{1}{2}$; divide in pilulas 180.)	No. 2 to 5.
		Pilulæ aloes et myrrhæ. <i>Rufus's Pills.</i> (Aloes oz. 2; myrrh. oz. 1; croci oz. $\frac{1}{2}$; syrup q. s. divide in pil. 480.)	No. 3 to 6.
		Pulvis aloes et canellæ. <i>Hiera Picra.</i> (Aloes lb. 1; canellæ oz. 3.)	gr. 10 to 20.
		Tinctura Aloes. (Aloes oz. 1; ext. glycyrr. oz. 3; alcohol dilut. O ij.)	f. oz. $\frac{1}{2}$ to f. oz. $1\frac{1}{2}$.
		Tinctura aloes et myrrhæ. <i>Elixir Proprietatis.</i> (Aloes; croci ana oz. 3; tinct. myrrh. O ij.)	f. dr. 1 to f. dr. 3
		Vinum aloes. (Aloes oz. 1; cardam. sem.; zingib. ana dr. 1; vin. O j.)	f. oz. $\frac{1}{2}$ to f. oz. 3
Cassia Marylandica. <i>American Senna.</i> (The leaves of the indigenous plant.)	From the Levant...	.....	dr. $\frac{1}{2}$ to dr. 1.
Colocynthis. <i>Colocynth.</i> <i>Bitter Apple.</i> (The fruit of the <i>Cucumis Colocynthis</i> , deprived of its rind.)			

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
		Extractum Colocynthis composi- tum. (Colocynth. pulp. oz. 6; aloes oz. 12; scammon oz. 4; cardam. oz. 1; sa- pon. oz. 3; alcohol. dil. cong. Made into an extract.)	gr. 5 to 30.
Elaterium. <i>Elaterium</i> . (The substance depo- sited from the juice of the fruit of the <i>Mo- mordica Elateri- um</i> .)	From the South of Europe.	Pilulæ Catharticae composita. Ext. coloc. c. oz. $\frac{1}{2}$; ext. jalap. calo- mel. ana dr. 3; gambog. scr. 2; di- vide in pilul. 180.)	No. 2 to 4.
Gambogia. <i>Gamboge</i> . (The concrete juice of the <i>Stalagmitis Cambogioides</i> .)	From Siam and Co- chin China.		gr. 1-16th to 1
		Pilulæ Gambogiae composita. (Pulv. gambog. dr. 1; aloes dr. $1\frac{1}{2}$; zingib. dr. $\frac{1}{2}$; sapon. dr. 2.)	gr. 2 to 6.
Hydrargyri Chlori- dum mite. <i>Calomel</i> .	See Table of Exci- tants.		gr. 10 to 15.
Hydrargyri Oxydum Nigrum. <i>Black Oxide or Prot- oxide of Mercury</i> .	See Table of Exci- tants.		gr. 3 to 30.
Hydrargyrum cum Magnesia. <i>Mercury with Magne- sia</i> .	See Table of Exci- tants.		gr. 5 to 15.
Jalap. <i>Jalap</i> . (The root of the <i>Ipo- mæa Jalapa</i> , <i>Con- volvulus Jalapa</i> .)	See Table of Exci- tants.		gr. 5 to dr. $\frac{1}{2}$.
	From Mexico.		gr. 10 to 40.
		Extractum Jalapæ.	gr. 5 to 20.
		Pulvis Jalapæ compositus. <i>Compound Powder of Jalap</i> . (Jalap. p. 1; potassæ bitart. p. 2.)	gr. 30 to dr. 1.
		Tinctura Jalapæ. (Jalap. oz. 8; alcohol dilut. O 2.)	f. d. 1 to f. dr. 3
Juglans. <i>Butternut</i> . (The inner bark of the <i>Juglans cinerea</i> ; —indigenous.)			gr. 5 to 30.
Magnesia. <i>Magnesia</i> .	From the carbonate of magnesia by calci- nation.	Extractum Juglandis.	gr. 5 to 30.
Magnesia Carbonas. <i>Carbonate of Mag- nesia</i> .	By decomposing the sulphate of magne- sia by the carbonate of potassa.		dr. $\frac{1}{2}$ to dr. 1; or more.
			dr. $\frac{1}{4}$ to dr. 2.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Magnesia Sulphas. <i>Sulphate of Magnesia.</i> <i>Epsom Salts.</i>	{ On a large scale, from sea water and salines; and from a union of magnesia with sul- phuric acid. }	.....	oz. 1 to oz. 2.
Manna. <i>Munna.</i> (The concrete juice of the <i>Fraxinus Or- nus.</i>)	{ From Calabria..... }	.....	oz. 1 to oz. 2.
Oleum Euphorbiae Lathyris. <i>Oil of Spurge.</i> (The expressed oil.)	{ ..... }	.....	m 20 to 30.
Oleum Ricini. <i>Castor Oil.</i> (The oil of the seeds of the <i>Ricinus Com- munis</i> —native of the East and West In- dies, and cultivated in the U. States.)	{ ..... }	.....	{ f. dr. to f. oz. and more.
Oleum Tiglii. <i>Croton Oil.</i> (The oil of the seeds of the <i>Croton Tig- lium.</i>)	{ From India..... }	.....	m $\frac{1}{4}$ to 2.
Podophyllum. <i>May Apple.</i> (The root of the <i>Pod- ophyllum peltatum</i> or 'mandrake,' of the United States.)	{ ..... }	.....	gr. 20 or 30.
		Extractum Podophylli.	gr. 5 to 15.
Potassæ Acetas. <i>Acetate of Potassa.</i>	{ From the union of carbonate of potas- sa and acetic acid. }	.....	dr. 2 to oz. 1.
Potassæ Bisulphas. <i>Bisulphate or super- sulphate of potassa.</i>	{ By supersaturating the carbonate of pot- assa with sulphuric acid. }	.....	dr. 1 or dr. 2.
Potassæ Sulphas. <i>Sulphate of Potassa.</i>	{ On the large scale, by various process- es. (See <i>Dispensa- tory.</i>) }	.....	dr. $\frac{1}{2}$ to dr. 5.
Potassæ Supertartras. Potassæ Bitartras. <i>Cream of Tartar.</i> (The tartar deposited during the fermenta- tion of acidulous wines.)	{ ..... }	.....	dr. 2 to oz. 1.
Potassæ Tartras. <i>Tartrate of Potassa.</i> <i>Soluble Tartar.</i>	{ From the union of the carbonate of potassa with the supertartrate of potassa. }	.....	dr. 1 to oz. 1.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Rheum. <i>Rhubarb.</i> (The root of the <i>Rheum palmatum</i> and others)	} From India and Russia.	}	gr. 20 to 40.
		Infusum Rhei. (Rhei dr. 1; aq. bullient. O. $\frac{1}{2}$.)	} f. oz. $1\frac{1}{2}$ to f. oz. 3.
		Pilulæ Rhei compositæ. (Rhei oz. 1; aloes dr. 6; myrrh oz. $\frac{1}{2}$; ol. menth. pip. f. dr. $\frac{1}{2}$; syrup aurant. q. s.;—divide in pilulas 240.)	} No. 2 to 4.
		Syrupus Rhei (Rhej oz. 2; aq. bullient. O j. sacch. pur. lb. 2.)	} f. dr. 1 to f. dr. 2; to infants.
		Syrupus Rhei aromaticus. <i>Spiced syrup of rhubarb.</i> (Rhej oz. $2\frac{1}{2}$; caryoph. cinnam. ana oz. $\frac{1}{2}$; nuc. myrist. dr. 2; alcohol dil. O ij; syrup O vi.)	} Do.
		Syrupus Rhej et Sennæ. (Rhej, sennæ ana oz. $1\frac{1}{2}$, cardam. dr. 3; aq. bullient O j; sacch. lb. 2.)	} Do. for infants. f. oz. 1. for adults.
		Tinctura Rhei. (Rhej oz. 3; cardam. oz. $\frac{1}{2}$; alcohol dilut. O ij.)	} f. oz. $\frac{1}{2}$ to f. oz. 1.
		Tinctura Rhej composita. (Rhej oz. 2; rad. glycyrr. oz. $\frac{1}{2}$; zingib. croc. ana dr. 2; alcohol dilut. O j; aq. f. oz. 12.)	} f. oz. $\frac{1}{2}$ to f. oz. 1.
		Tinctura Rhej et Aloes. <i>Elixir sacrum</i> (Rhej dr. 10; aloes dr. 6; cardam. oz. $\frac{1}{2}$; alcohol dilut. O ij.)	} f. oz. $\frac{1}{2}$ to f. oz. 1.
		Tinctura Rhej et Gentianæ. (Rhej oz. 2; gentian oz. $\frac{1}{2}$; alcohol dilut. O ij.)	} f. oz. $\frac{1}{2}$ to f. oz. 1
		Tinctura Rhej et Sennæ. (Rhej oz. i; sennæ dr. 2; sem. coriandr. fœnicul ana dr. 1; santali rubr. dr. 2; croci; ext. glycyrr. ana dr. $\frac{1}{2}$; uvar. pass. lb. $\frac{1}{2}$. alcohol. dilut. O iij.)	} f. oz. $\frac{1}{2}$ to f. oz. 1.
		Vinum Rhei. (Rhej oz. 2; canellæ dr. 1; alcohol dilut. f. oz. 2; vine O j.)	} f. dr. 2 to f. oz. 2.
Scammonium. <i>Scammony.</i> (The concrete juice of the root of the <i>Convolvulus scammonia</i>)	} From Syria.		gr. 5 to 10.
		Confectio Scammonii. (Scammon. zingib. ana. oz. 1; ol. caryoph. m 20; syrup aurant. q. s.)	} dr. $\frac{1}{2}$ to dr. 1.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Senna <i>Senna</i> . (The leaves of the <i>Cassia acutifolia</i> , the <i>Cassia obovata</i> , and the <i>Cassia elongata</i> .)	} From Egypt, &c.	.....	dr. $\frac{1}{2}$ to dr. 1.
		Confectio Sennæ. <i>Lentive electuary</i> . (Sennæ oz. 8; coriandr. oz. 4; Gly- cyrr. oz. 3; ficorum lb. 1; pulp. prunor; pulp. tamarind.; pulp. cas- sia fistul. ana lb. $\frac{1}{2}$; sacch. lb. $2\frac{1}{2}$; aq. O iv.)	} dr. 2 to oz. $\frac{1}{2}$.
		Infusum Sennæ. (Sennæ oz. 1; coriandr. dr. 1; aq. O 1.)	
		Infusum Sennæ cum Tamarindis. (Tamarind. oz. 1; sennæ dr. 1; cori- andr. dr. 1; sacchar. fusc. oz. $\frac{1}{2}$; aq. bullient. f. oz. 8.	} f. oz. 2 to f. oz. 4.
		Syrupus Sennæ (Senna oz. 2; sem. fœnic. oz. 1; man- næ oz. 3; sacchr. pur. lb. 1. aq. bul- lient. lb. 1.)	
		Tinctura Sennæ. <i>Elixir salutis</i> . (Sennæ oz. 3; sem. carui. dr. 3; sem. cardam. dr. 1; uvar. pass. oz. 4; al- cohol dilut. lb. 2.)	} f. dr. 2 to f. oz. 1.
		Tinctura Sennæ et Jalapæ. (Sennæ oz. 3; jalap oz. 1; coriandr; carui ana. oz. $\frac{1}{2}$; cardam. dr. 2; sacch. oz. 4; alcohol. dilut. lb. 3.)	
Sinapis <i>Mustard</i> .	} See Table of Exci- tants.	.....	} 1 tablespoon- ful of theseeds of the white.
Sodæ et Potassæ Tar- tras <i>Turtrate of Potassa</i> and Soda. <i>Rochelle Salt</i>.		.....	oz. 1 to oz. $1\frac{1}{2}$.
Sodæ Phosphas. <i>Phosphate of Soda</i> .	} From a union of powdered bones burnt to whiteness, sulphuric acid and carbonate of soda.	.....	oz. 1. to oz. 2.
Sodæ Sulphus. <i>Sulphate of Soda</i> . <i>Glauber's Salts</i>.		.....	oz. $\frac{1}{2}$ to oz. $1\frac{1}{2}$.
Sodii Chloridum. <i>Common Salt</i> .	} See Table of An- thelmintics.	.....	oz. $\frac{1}{2}$ to oz. $1\frac{1}{2}$.
Sulphur. <i>Sulphur</i> . <i>Erimstone</i>.		.....	dr. 1 to dr. 3.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Veratrina. Veratria. Veratrine. (The active principle of the <i>Veratrum al-</i> <i>bum</i> , <i>veratrum saba-</i> <i>dilla</i> , <i>colchicum au-</i> <i>tumnale</i> , &c.)		Sulphur præcipitatum. Milk of sulphur. (A precipitate from a mixture of sul- phur, fresh burnt lime, muriatic acid and water.)	dr. 1 to dr. 3.
			gr. $\frac{1}{9}$ to $\frac{1}{6}$.
Aquæ Minerales. (Sulphuræ et Salinæ. Mineral Waters. Sulphureous and sa- line.		The Sulphur Springs of Harrowgate, and Dinsdale, England, and Moffat in Scotland, and of Baresges, Bag- neres de Luchon, Cauterets, Bonnes, Aix, in Savoy, and Aix-la-Chapelle, in Europe; those of the White sul- phur, Salt sulphur, and Red sulphur, of Virginia, &c. &c. The <i>thermal</i> <i>saline springs</i> of Plombières, Bour- bonne-les-Bains, Balaruc, Bagnères Adour, Bourbon—Lancy, in France; —of Carlsbad, Baden, and Toeplitz, in Germany;—of Lucca, St. Julian, &c. in Italy; and the <i>cold saline wa-</i> <i>ters</i> of Epsom and Cheltenham in England; of Seidlitz and Seydschutz, in Germany; of Saratoga and Ball- ston, New York; and Harodsburch or Grenville, Kentucky.	
Enemata. } Clysters. }		Gruel, or molasses and water, with common salt and oil, or castor oil, or Epsom salts, &c. &c.	
Suppositoria. } Suppositories. }		A piece of turpentine soap, smeared or not with castor oil or turpentine. Also, the galvanic agents referred to in the text.	

SECTION VII.

EMMENAGOGUES,* AND ABORTIVES.†

Definition of emmenagogues—Modus operandi—No direct emmenagogues—Abortives—Definition of—Effects of the ergot of rye—Abortives dangerous to the mother.

EMMENAGOGUES may be defined—Agents, that promote the menstrual discharge.

That there are any such specific agents is by no means established. In the present state of our knowledge, indeed, we may affirm, that none exist. This, experience alone has taught us; for there is obviously no more reason, why there should not be substances capable of exerting a remedial agency on the organs concerned in the function of menstruation, than that there should not be others, which exert a cathartic or emetic operation by their preference for the stomach and intestines.

The remarks of Dr. Paris on this division of medicinal substances exactly correspond with my own.—“As amenorrhœa, or retention of the menses,” he says, “is generally the effect of a morbid state of the body, it follows, that remedies capable of acting as emmenagogues can only be *relative* agents, unless indeed we are disposed to accede to the opinion so generally maintained in the writings of the older physicians, but now generally discarded, that certain substances exert a specific action upon the uterus. It may certainly be asserted without fear of contradiction, that there are many substances, which, when received into the stomach, have their stimulant operation more particularly determined to one part than to another;—alkalies, for example, to

* Menagoga, from *εμμηνα*. ‘the menses,’ and *αγω*, ‘I expel.’

† Amblotica, Ecboia, Apophthoria, Ectrotica.

the kidneys; cantharides to the bladder; mercury to the salivary glands, &c. Reasoning therefore by analogy, it was not unphilosophical to conclude, that similar medicines might exist with respect to the uterus; but experience has negatived the supposition, there being no proof of any of the substances styled *emmenagogues* producing their effects by any *specific* influence upon the uterine system. If the term *emmenagogue* be assumed conventionally, according to this view of the subject, it may be retained without any fear of error, otherwise it would be wiser to remove the name from our classification.”*

One of the most recent writers on *Materia Medica* and *Therapeutics* has given us the following table of ‘direct’ emmenagogues, or, in other words, of such as are “supposed to operate by their stimulant influence, on the uterus itself,” and he has subdivided them, it will be observed, into *immediate* and *mediate*. “In the second of these subdivisions,” he says, “some substances will be found, the direct influence of which on the uterus is doubtful; they maintain their place rather in conformity with the prevailing opinions, than from a conviction that their action on the uterine system is such as to authorize the position, which they hold.”†

“ Direct Emmenagogues :

1. IMMEDIATE.

a. *Electricity*.—*Electricitas*.

2. MEDIATE.

* *Organic Products*.

b. *Oleo-Resins*.—Contained in
Roots—*Polygala Senega*.
 Ruta graveolens.
Herb.—*Juniperus Sabina*.

c. *Bitter Principle*.—Contained in
Roots.—*Rubia Tinctorum*.

** *Inorganic Substances*.

d. *Mercurials*.—*Præparationes Hydrargyri*.”—

* ‘*Pharmacologia*,’ Amer. Edit. p. 92.

† Dr. A. T. Thomson, *Op. cit.* ii. p. 44.

Yet none of these agents can be properly regarded as producing their effect by any specific operation on the uterus. The only one, which we *know* to operate upon that organ—inasmuch as we can subject the region directly to its action—is electricity; and it does so only by virtue of that excitant agency, which it exerts upon every other tissue—not by a specific action, which can entitle it to the appellation of a ‘true’ or ‘direct’ emmenagogue.

Dr. Thomson’s doubt of the propriety of his own classification, and of the admission of direct emmenagogues, is signally shewn in the following remarks, after having described the fancied emmenagogue virtues of the different articles comprised in the list I have cited. “Upon the whole, from what has been said, it is obvious, that electricity is the only direct emmenagogue, and that the idea of the others acting upon the uterus itself is rather inferred than certain. It is nevertheless true, that, in whatever manner they act, emmenagogues stimulate the uterus; and therefore some caution is requisite to be observed in their administration. We must be certain, in the first place, that the suppression is not connected with pregnancy: in such a state, it would be highly injurious to prescribe direct emmenagogues; as not only abortion may be induced, but inflammation may be set up, and lay the foundation of an organic disease of the uterus. There is often, indeed, much difficulty in deciding upon the propriety of employing direct emmenagogues, even when the suppression is not connected with pregnancy: the uterus may be in such a state of active disease as to render their influence upon it extremely hazardous.”*

Much harm has arisen from a belief in the existence of ‘direct’ emmenagogues, without discriminating the causes, that may have given rise to the amenorrhœa or suppression of the menstrual flux. In all cases, such causes must be appreciated, and the treatment be directed to their removal, as well as to that of the morbid condition of the general system, or of the uterus, produced by them. Accordingly, emmenagogues must always be of an indirect kind, and the term, as Dr. Paris has suggested, should be retained as a mere conventional one to express such an indirect operation. Most commonly, amenorrhœa is connected with a state of atony of the general system, which demands the use of excitants; and hence, amongst the reputed emmenagogues, we

* Op. cit. ii. p. 453.

have a long catalogue of substances belonging to the divisions of excitants proper, and of tonics. The oxides and salts of iron have been especial favorites with the practitioner; and, accordingly, we find enumerated, under this division of remedial agents, the carbonate, the sulphate, the black oxide, the alkaline solution, the ammoniuret, and the tartrate of that metal. But, although atony may be the general cause of amenorrhœa, the disease is sometimes induced by an opposite condition of the system, in which, excitants would be manifestly improper, and remedies of another kind are clearly indicated. This is not the place to inquire, whether menstruation be a process of secretion, or of simple transudation of blood through the parietes of the vessels of the uterus. I have elsewhere expressed the opinion,* that it is a secretion, and that the fluid differs somewhat from mere blood, but whether we regard it in this light, or as a periodical hemorrhage, it is clear, that the lining of the uterus must be a centre of fluxion for the nervous and vascular systems, during the period of the flow; and if any powerful mental impression be made, when the discharge is about to take place; or any source of morbid irritation be present in any viscus; or if there be undue energy in the system generally, and in the uterus in particular;—or an opposite state; the due concentration of nervous and vascular energy towards the uterine system may be interfered with, and amenorrhœa supervene, and continue until such distracting cause is removed.

From what has been observed, regarding the conditions of the general system, which may occasion amenorrhœa, it will be easy to understand, that the plan of medication must, in all cases, vary, according to the state of the general health. But remedies may be administered as emmenagogues, which act but little on the general system, affecting the uterus by contiguous sympathy chiefly. Thus, if that viscus be in a state of asthenia, a diuretic or local stimulant to the kidneys may prove emmenagogue; and, in the same manner, a cathartic, especially one that acts on the lower portion of the intestinal canal, may excite the uterus to the point appropriate for the fulfilment of its healthy functions. On these grounds, aloes, as we have seen, has acquired its reputation as an emmenagogue, and there is perhaps no article of the *materia medica*, which has been so extensively administered with this view. It has no specific operation on the uterus: its

* *'Human Physiology,'* First Edit. ii. 230; and Second Edit. ii. 303.

agency is confined to its cathartic powers,—the local stimulation, thus induced, extending by contiguous sympathy to the uterus, and, in this indirect manner, occasionally producing a restoration of the suppressed secretion.

Formerly, the condition of the uterus was looked upon as exerting a most important influence on the rest of the economy, and as the cause of various morbid phenomena, which could not well, in the existing state of knowledge, be referred to any other agency. The protean symptoms of hysteria, as the name imports, were all considered to be engendered in the uterus. The name, still retained,* and the terms *præfocatio matricis*, *vapores uterini*, *strangulatio uterina*, and the German names *mutterkrankheit*, *mutterbeschwerden*, and *mutterbeschwerung*,—from *mutter*, ‘the uterus,’—sufficiently indicate the supposed seat of the mischief. It is now admitted to be caused by cerebro-spinal irritations, connected in particular cases with uterine disturbance,—such disturbance, however, appearing to act indirectly only, by producing, or developing general nervous irritability; and this view is confirmed by the fact, that well marked hysteria is occasionally met with in men.

The condition of the uterine functions has always to be looked to,—especially in chronic diseases,—but experience has sufficiently shewn that any aberration of those functions is more frequently the consequence than the cause of such disease. I cannot, indeed, conclude the consideration of emmenagogues better than by citing the following apposite remarks of Dr. Thomson, at the termination of his investigation into the properties usually assigned to this class of remedies. “The importance of the catamenia in preserving the health of the female habit is undeniable; and therefore every thing that can tend to maintain its regular return, and to promote its due quantity, is of great importance in a practical point of view. In every chronic complaint of a female it is requisite to ascertain the state of the catamenia; but, before advising any medicine for the purpose of influencing the uterus in any manner, the cause of the suppression or the irregularity, of whatever description it may be, must be minutely investigated. Without obtaining such a knowledge of the state of the organ, and ascertaining how far the suspension or irregularity is due to the condition of the organ itself, or to the general system, our practice must ever be uncertain: in floundering

* From *ἰστέρα*, ‘the uterus.’

about and trying various remedies, without rule or discrimination, we may, it is true, stumble by accident on something effectual; but much evil may be previously produced.”*

ABORTIVES.—What has been said of emmenagogues might, perhaps, be extended to the division of abortives admitted by Dr. Eberle; which he defines to be—‘substances, which promote the parturient energy.’ Certain it is, that, thirty years ago, no man of science, in this country, would have asserted, that we are possessed of any such agent, acting, that is, by virtue of specific powers over the uterine fibres. Since that period, however, such an agent has been brought to the notice of the profession, and has received so many testimonials in its favor as to cause its admission into every work of materia medica. I mean the *secale cornutum*, ‘spurred rye’ or ‘ergot of rye,’ whose old German names, *mutterkorn* and *gebaerpulver*, sufficiently indicate, that it has long possessed the character of exerting some action on the uterus; but still this belief was mainly confined to the vulgar,—although the old *pulvis parturientis* of the Marburg pharmacopœia consisted principally of ergot,—until, about twenty-seven years ago, attention was called to it by Dr. Stearns of Saratoga county, New York. Since that time, the weight of testimony in its favor has been overwhelming; yet there are many eminent individuals, who deny it all power over the uterus, both in the unimpregnated and impregnated states, and affirm, that it acts only indirectly on that viscus, through the general indisposition it occasions; and, therefore, like numerous other agents, ought rather to be esteemed an indirect than a direct abortive. Such is the opinion of a recent distinguished writer and experimenter on the properties, possessed by medicinal agents; who goes so far as to affirm, that there is no “farther connexion between these degenerate grains and the uterus, than the word *mutter* (uterus,) which is common to both.”†

Dr. Jörg is professor of obstetrics in the university of Leipzig and director of the school of midwifery there, and the whole object of his publication is, as the title imports, to shew, that the use of internal excitants, for promoting the delivery of the

* Op. cit. ii. p. 471.

† Dass der gebrauch innerer reizmittel zur beförderung der geburt des kindes unnöthig, fruchtlos, und gesunden Frauen sogar schädlich sei; nachgewiesen von Dr. G. Ch. G. Jörg, Zeitz, 1833, p. 40.

child, is unnecessary, fruitless, and even injurious to the healthy female.

From the results of various experiments, Dr. Jörg infers, that the ergot, when given in small doses, produces little or no effect upon the functions; but, when fresh dried in an oven, and administered in large doses, it oppresses the stomach, occasioning nausea, vomiting, colic, liquid evacuations, and destroys the appetite, and the digestive powers;—these effects being accompanied by a sense of weight in the head; vertigo, and headache; and, in short, by general torpor of the system. Under these circumstances, he thinks, it is not difficult to understand, that the connexion of the fœtus and uterus may be modified, and that abortion may take place.*

It has long been believed, that the spurred rye has been the cause of extensive epidemic affections, which, in consequence of the sense of formication accompanying them, have been termed generically by the Germans, *kriebelkrankheiten*. This form of the disease has also been called, from the convulsive symptoms attending it, ‘convulsio cerealis,’ ‘convulsio ab ustilagine,’ *convulsion de Sologne*; and, from its cause, *ergotisme convulsif*. Nor is this the only malady ascribed to the ergot. Under its use, torpor and numbness of the hands and feet come on. They lose sensation and the power of motion, and separate from the body by dry gangrene. This condition has been termed ‘ergot,’ or ‘mildew’ mortification, ‘gangrenous ergotism,’ ‘necrosis ustilaginea,’ *gangrene des Solonois*, and *gangræna ustilaginea*. Dr. Eberle seems disposed to doubt, that these affections have been produced by the ergot. “Epidemics of a very fatal character,” he says, “were ascribed to the effects of the ergot, mixed with the rye, which was ground up for bread stuff; what foundation there is for this opinion I cannot undertake to say. It appears to me unphilosophical, however, to account for epidemics by ascribing them to a cause, which must always be, in a degree present.”† In all such ascription of causes it is proper to be cautious, but I apprehend, that we must admit the ergot to have been the origin of those morbid phenomena, inasmuch as the experiments of Jörg, Hertwig, Halbach, Lorinser, and others have shewn it to possess similar morbid influence over the animal body.

They, who regard the ergot to be possessed of specific powers,

* Op. citat. p. 54. † Op. cit. i. 327.

capable of producing contraction in the uterine fibres of the parturient female, do not, however, expect or wish it to produce the morbid impressions alluded to by Jörg, and others. When given in appropriate, and properly repeated doses, the uterine action, they assert, becomes more energetic, and the contraction is constant and unremitting; hence differing from the alternation of spasmodic effort and relaxation, which characterizes natural labor,—but there is no accompanying indisposition. In no country has this substance been more employed of late than in the United States, and in no country has it so many supporters. Yet there are many, who, from their experience, are not satisfied, that it exerts the power over the gravid uterus that has been ascribed to it. It must be admitted, that no cases could present themselves, in which it is more difficult to trace accurately the relation between cause and effect. Every one, who has practised extensively in obstetrics, must have observed, that the parturient efforts occasionally flag, and indeed are wholly suspended, yet they recur, and the labor proceeds rapidly to a favorable termination. Now, if in any such case, a remedy, presumed to be an abortive, were administered during the period of the cessation of pain, the recurrence of the pain in this sudden manner, could hardly fail to be ascribed to the antecedent—the administration of the presumed abortive. Let the obstetrical practitioner, who has never had recourse to any such agent, call to mind, how few the cases are, in which delivery has had to be assisted, in consequence of the *total* cessation of the pains, and how common it is to meet with a partial or temporary cessation; and he will see, that the absolute necessity for the use of an abortive has but rarely arisen. I have given the ergot, in several cases of lingering labor, in which pains have subsequently recurred, after having been for a time arrested, but I have not been able to satisfy myself, that the favorable result was owing to the administration of the ergot. Practitioners, however, of the greatest eminence, place full confidence in its powers to excite contraction of the uterine fibres, and, although in many of the cases, which fell under their observation, the pains might have returned without the agency of the ergot, we cannot reject such respectable testimony, and maintain, that all the cases were of this character, and, consequently, that the ergot is possessed of no specific powers as an abortive; nor can we, if we admit their observations to be correct, consider, that the abortive effects of the remedy are produced indirectly, by violence done the con-

stitution, inasmuch as we have seen, that in most of the recorded cases of benefit accruing from its administration, no such violence appears to have been done by it.

Admitting, however, the full power ascribed to the ergot, the cases, I repeat, can be few, indeed, in which its agency is demanded; and it is, doubtless, often had recourse to, where the propriety of the administration of it, or of any other agent, is extremely questionable.

Of late, it has been attempted to shew, that the ergot has not only a specific action over the uterine fibres, but that it may be serviceable in inflammatory affections of the vagina, as in leucorrhœa; nay, some have affirmed that it is an excellent hæmostatic in hemorrhages from any of the outlets of the body; but, in none of these cases, is the testimony, in my mind, sufficient to establish the point.

If hesitation may be permitted in regard to the possession of any specific powers over the uterus by the *secale cornutum*, there can be none as respects the other substances, that have been employed as abortives. All these are indirect agents only, and all act upon the ovum through the mother, endangering her life as well as that of her infant. The remark of Ovid, "*Sæpe suos utero quæ necat, ipsa perit.*"—"She, who destroys her offspring in utero, often perishes,"—is admitted by all writers on medical jurisprudence, and by every one, who has at all investigated the subject. The drugs and agencies, invoked with the view of effecting abortion, are of the most powerful kind;—emetics, purgatives, acro-narcotic poisons, mercury, &c. Bleeding, too, has often been practised with this intent, but it has rarely, if ever, been successful.

The German authors* still admit a class *aristolochica*,—of agents, that promote the lochial secretion, but it need hardly be said, that we have no such 'direct' agents, and that the pathological cause of the suppression or diminution of the discharge must always be appreciated, and combated.

* Conradi, Handbuch der allgemeinen therapie. u. s. w.; s. 126.

TABLE

OF REPUTED EMMENAGOGUES, AND THEIR OFFICIAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Cunila Pulegioides. Hedeoma Pulegioides. <i>Pennyroyal.</i> (Indigenous.)	}	..... Generally given in infusion.....	{ Dose not limited.
		—Oleum hedeomæ } (The distilled oil.) }	m 2 to 10.
Helleborus Niger. Melampodium. <i>Black Hellebore.</i> (The Root.)	} From Northern and temperate Europe.	.....	gr. 10 to 20.
		Tinctura Hellebori Nigri. Tinctura Melampodii. (Helleb. nigr. oz. 4.; alcohol. dilut. O ij.)	m 30 to 40.
Mentha Pulegium. Pulegium. <i>European Pennyroyal.</i>	} From Europe.....	..... Generally taken in infusion.	
		Oleum Pulegii. } (The distilled oil.) }	m 1 to 5.
Rosmarinus. <i>Rosemary.</i> (Indigenous on the shores of the Mediterranean.)	}		
		Oleum Rosmarini.	m 3 to 6.
Rubia. <i>Madder.</i> (The root of the <i>Rubia Tinctorum.</i>)	} From the south of Europe.	.....	gr. 20 to 30.
Sabina. <i>Savine.</i> (The leaves of the <i>Juniperus Sabina.</i>)	} From the south of Europe and the Levant.	.....	gr. 15 to 20.
		Oleum Sabinæ. (The distilled oil.)	m 3 to 6.
Secale Cornutum. <i>Spurred Rye.</i> <i>Ergot.</i> (The diseased seed [?] of the <i>Secale cereale</i> or Rye—caused by the puncture of the <i>Aphis graminis</i> ;—a parasitic plant—the <i>Sclerotium clavus</i> ; or the diseased grain, incrustated by a parasitic fungus—the <i>Sphacelia segetum</i>; [?].)	}	.....	{ gr. 15 to 30. as an abortive.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Senega. Seneka. (The root of the <i>Polygala Senega</i> .—Indigenous.)	}	gr. 10 to 30.
		Decoctum Senegæ. (Senegæ oz. 1; aq. O ij. boil to a pint.)	{ f. oz. 1½ to f. oz. 3.
Tanacetum. Tansy. (The herb <i>Tanacetum vulgare</i> .)	}	gr. 30. to dr. 1.
		Often, also, given in the form of infusion or tea.	

* NOTE.—The list of Agents is compiled from the ‘Elements of Therapeutics,’ of Professor Chapman.

SECTION VIII.

DIAPHORETICS.

Definition of diaphoretics—Largely invoked in Therapeutics—Disease not often induced by suppressed perspiration—Modus operandi of diaphoretics—Are indirect agents—How their operation may be aided—Their therapeutical application.

Diaphoretics* are defined to be—"agents that augment the function of transpiration."

As it was at one time imagined, that almost every disease, to which mankind are liable, is produced by obstructed perspiration, the class of diaphoretics was largely employed in medical practice, and numerous agents were admitted into the catalogues of the *materia medica*, which were supposed to be capable of augmenting the cutaneous exhalation. Even yet, this cause of disease is repeatedly invoked, not only by the unprofessional, but by many of the profession. "Health," says Dr. Eberle, "is very intimately connected with the regular performance of the perspiratory function. Whenever the transpiration by the skin is suddenly checked, more or less derangement of the system is invariably the consequence. That portion of the circulating fluid, which nature designs to be cast off by the cutaneous emunctories, is no longer fit for the purposes of the animal economy; is retained and becomes a source of morbid irritation to the heart and other organs."†—"Disease," says Dr. Thomson, "is frequently the consequence of a sudden check to the perspiratory function; means, therefore, have been sought for to restore it; and the substances, classed as diaphoretics, are supposed to have that power."‡

* Diapnoica, from *διαφθερω*, 'I dissipate.'

† 'A Treatise of the *Materia Medica*, &c.' Second Edit. ii. 153.

‡ 'Elements of *Materia Medica*, &c. ii. 175.

It may admit, however, of well-founded doubt, whether disease is ever induced by suppression of the cutaneous exhalation. The two great fluids of depuration are the transpiration—cutaneous and pulmonary—and the urine. In summer, the former predominates largely over the latter, whilst in winter the opposite is the fact. Hence, there appears to be a sort of compensation effected between the two depurations, so that if one be diminished by a change of atmospheric temperature, the other is augmented. For this reason, we should not anticipate any morbid effect from a general check given to perspiration, were we even ignorant of the impunity, with which we may pass from a heated apartment to the external air, and which follows the use of the cold bath, after the individual has been exposed to a very elevated temperature, as in the Russian vapor bath. Observation has, indeed, sufficiently shewn, that danger is less to be apprehended from such general checks, than from the partial and irregular application of cold and moisture. The danger of having the feet cold and wet, or of sitting with the part of the body exposed to a draught of cold air, is proverbial; yet, if we attempt to explain this by the check given to perspiration, we totally fail; for the loss of the ordinary depuration, in so small a portion of the body, is obviously insufficient to account for the phenomena; yet, as I have remarked, disease is far more apt to be induced, in such case, than when the whole body is exposed to a sudden alteration of temperature from hot to cold, and when the check to the cutaneous depuration ought necessarily to be to a much greater extent. I have, elsewhere, remarked,* that there is perhaps in every one, at any particular time, some organ or tissue of the body more disposed to take on morbid action than another; and that, between every part of the capillary surface of the body, such an extensive sympathy reigns, that if one part be irregularly and morbidly impressed, such impression vibrates to every part of the system, so that the tissue or organ, most disposed to take on morbid action at the time, assumes it. Hence, if a dozen individuals be exposed to the irregular application of cold and moisture to the feet, they may not all have the same disease induced, because in all there was not the same disposition in a particular organ or tissue to the assumption of disease.

This irregular action of the capillaries of the part is the first link in the chain of phenomena, not the obstruction of perspiration. On this head, Dr. W. F. Edwards, of Paris, has expressed

* 'Elements of Hygiène,' p. 69,

himself in a sound and rational manner. The insensible perspiration he regards as a purely physical phenomenon of 'evaporation,' whilst the sensible "is a loss ordinarily produced by a vital action, in the form of a liquid which transudes." In prosecuting the consideration of this subject, he remarks;—"all that we have hitherto shown on the subject of perspiration will considerably facilitate our examination of a question, which naturally presents itself. Is perspiration susceptible of being suppressed? It is easier to resolve this question with regard to man and other warm-blooded animals, than with respect to the cold-blooded vertebrata. Let us see what is the result of a very low temperature upon warm-blooded animals. We know by the effect of cold upon the sweat, that it diminishes transudation. Now let us suppose, that it may, by its intensity, suppress it altogether, there will remain perspiration by evaporation, which will always take place, however humid the air may be. The high temperature of man, and other warm-blooded animals, warms the air in contact with the body, and changes its hygrometric state by removing it from its extreme of humidity, and consequently occasions evaporation. If, on the other hand, the temperature of the air be raised to an equality with that of the body, at the time that it is saturated with humidity in order to suppress evaporation, then perspiration by transudation is excited, and takes place to such an extent in man and other warm-blooded animals, that the sweat will stream from all parts of the body. We can then, in no case, suppress their perspiration; it will be performed either by evaporation or by transudation. We ought therefore to be careful, how we take literally what we find in medical books respecting suppressed perspiration. There can be no such thing. That there may be suppression of sweat is evident to every one; but it does not follow, that even in these cases, there is no transudation.

¶ "Since it is difficult to assure ourselves directly, whether transudation is ever entirely suppressed in man, and other warm-blooded animals, let us see what the cold-blooded vertebrata will offer on this point. The batrachians are the best adapted to this kind of researches, on account of the nakedness of their skin, of the fineness of its texture, of the copious loss, which may be incurred through its medium, and, consequently, of the relation, which their perspiration bears to that of man. On exposing frogs to the temperature of 0° cent. (32° Fahr.) in humid air, in order to suppress perspiration by evaporation, they have lost by transudation, in different experiments, the thirtieth

part of their weight. Transudation is more abundant in these animals than in man, though the latter be placed in circumstances much more favorable. When we consider how sensible these creatures are to cold, how much the activity of all their functions is diminished at a low temperature, and how much they may even then lose by transudation, it is not to be supposed, that cold suppresses this mode of perspiration in man, and the less so from his having a temperature of his own, which varies very little with the changes of the atmosphere, a condition which has a powerful tendency to maintain transudation. It may be very much diminished by the action of cold, but it appears that it cannot be altogether suppressed. It is a remarkable but well known fact, that when life is sinking, and to appearance nearly extinct, the body is covered with sweat—so strong is the tendency to continue this function.*

In any mode, consequently, of viewing the subject, it does not appear, that we can ascribe any series of morbid phenomena to the simple suppression of perspiration. Such being the fact, the indication of restoring suppressed perspiration—if it be admitted at all—must exist much less frequently than has been imagined. Yet there are but few classes of remedies, that are more used, especially by the older practitioners, than diaphoretics, and probably none which are more uncertain in their operation, and on which less reliance ought to be placed. Most of them, too, are agents, which stimulate the heart and arteries, and hence it has happened, that the indiscriminate employment of heating diaphoretics has been productive of much mischief, in febrile and inflammatory disorders. In a state of health, any thing, which gives occasion to the greater propulsion of blood into the cutaneous capillaries, will produce diaphoresis. In this way, exercise and external heat exert a diaphoretic agency; but when the capillary action is in a state of exaltation from disease, the same agencies are not followed by a like result. This state of exaltation has to be reduced before diaphoresis can be effected. The same thing is also exhibited in another way. During the heats of summer, the cutaneous capillaries are kept in a state of perpetual erethism, and although the sensible perspiration may be exhaled to a great extent, it would probably be more largely elicited were the erethism less; accordingly, when we take iced

*On the influence of physical agents on life'.—Hodgkin and Fisher's translation. Lond. 1832.

water or any iced drink under such circumstances, the refrigerant influence is exerted on the capillaries of the stomach, and, owing to the extensive sympathy, that exists between every part of the capillary surface, the cooling influence is at once communicated to the whole capillary system, the erethism is thus reduced, and copious perspiration ensues. Every one must have observed how rapidly the sensible perspiration is thrown out in hot weather after the use of iced drinks. The effect is here diaphoresis, but the remedy operates as a 'refrigerant'—a class of agents far more efficacious—as we shall see—than diaphoretics. It may be doubted, indeed, whether we have any internal remedies, which are capable of acting as direct diaphoretics; that is, by virtue of specific properties, which they possess over the cutaneous exhalants. Dr. Paris thinks, that mercurials and sulphur act in this way, but the only evidence we have of this is, that they pass off by the skin, and as they emerge from the system in this manner, it would be fair, perhaps, to presume, that they may act on the cutaneous capillaries, but we have no evidence in favour of their producing augmented diaphoresis.

The author, to whom I have just alluded, has given the following table of what he considers the *modus operandi* of diaphoretics.

“ DIAPHORETICS

Occasion their effects—

I. By stimulating the cutaneous capillaries.

A. By external application.

The stimulus of heat, frictions, &c.

B. By medicines which enter the circulation and stimulate the cutaneous vessels by *contact*.

Mercurials—sulphur.

C. By medicines which act on the surface *sympathetically*, through the medium of the stomach.

Cold drinks, &c.

II. By increasing the general action of the vascular system.

*Violent exercise—Ammonia—Guaiacum—Alcohol
—Warm bath.*

III. By relaxing the morbidly constricted mouths of the perspiratory vessels.

Antimonials—Cold affusion—Venesection—Saline diaphoretics.”*

We have already seen, that the *modus operandi* of cold drinks cannot be referred to any ‘stimulation’ of the cutaneous capillaries, and that they operate rather in the third method “by relaxing the morbidly constricted mouths of the perspiratory vessels.” The same may be said of the warm bath, which certainly does not act by increasing the general action of the vascular system. Such may be, and is, the effect of the *hot* bath—aqueous, vapor, or air—but the warm bath acts precisely like the cold, by diminishing the action of vessels. The mistake is often made, and a hot stimulating bath is occasionally administered in violent inflammatory attacks, instead of the warm and soothing,—to the manifest detriment of the sufferer. The application of warmth, in the form of the warm water bath, is one of the most valuable therapeutical agents, which we possess; especially in the inflammatory and spasmodic disorders incident to childhood. At one time, the salutary agency was universally ascribed to the restoration of suppressed perspiration. It is now known to modify the condition of the capillary system, reducing it when over-excited, and producing a beneficial action of equalization in the circulatory movements, so as to diminish the exaltation of vital manifestations in the organ labouring under inflammation or spasm.

In reality, there are no substances, administered as diaphoretics, on whose direct agency any dependence can be placed, unless they are such as are made to come in contact with the cutaneous surface. Diaphoresis follows the employment of many internal means, but the result is produced indirectly. Antimonials, for example, have been much relied upon for ‘relaxing,’ as Paris has it, “the morbidly constricted mouths of the perspiratory vessels;” but this result is not produced by any specific action on those vessels, so much as by exciting a new impression on the system, which breaks in upon the erethism of the capillary vessels. Perhaps we have no class of remedies more uncertain in their operation than antimonial diaphoretics, as ordinarily administered. I might indeed say, that there are no agents so de-

* ‘Pharmacologia,’ p. 99.

void of any beneficial action; and yet, if they are given so as to excite nausea, or a state approaching this, diaphoresis often results, but then it is immediately produced by the state of diminished vital activity, occasioned by the remedy acting as a 'nauseant,'—a set of agents, as we shall see, possessed of the most valuable properties for reducing any morbid exaltation of the vital forces. The faith, however, that has existed in antimonials, as usually prescribed, for exerting a febrifuge action, has not been without its advantages. Whilst trust is reposed in them, the feverish invalid is left in quietness, and the irritating system of cathartic after cathartic is, for the time, dispensed with; but that the antimonial is, in many cases, inert, has been sufficiently shewn from numerous experiments with the 'Pulvis Antimonialis' of the pharmacopœias—a powder introduced as a factitious "James's powder"—which have demonstrated, that the preparation is often almost wholly inoperative, even when given in very large doses. It is rarely employed on the continent of Europe, but confidence is still, although unworthily, reposed in it, by many practitioners of this country, and of Great Britain. "This powder," says Dr. Thomson, "is a compound of oxide of antimony, antimonious acid, and phosphate of lime. According to the London and Dublin pharmacopœias, it is formed by burning together one part of sulphuret of antimony and two parts of shavings of hartshorn; the Edinburgh college orders equal parts. When brought to a white heat, the sulphur is completely expelled, and the oxide, gradually absorbing oxygen, partly passes into antimonious acid. It is the latter substance which gives the yellow colour to the preparation when it is strongly heated. It is an inodorous, insipid, dull white powder, insoluble in water, and scarcely soluble in acids. The utmost diversity of opinion exists respecting the utility of this preparation; many practitioners contending that it is perfectly inert, others asserting, "that it is one of the best antimonials we possess."* From the result of its administration in my own practice, I cannot place any confidence in its diaphoretic powers. If there be much muriatic acid present in the stomach, it may prove active; but in general it displays no influence whatever on the system. It has been given in doses of sixty, eighty, and one hundred and thirty grains without any sensible effect. Its occasional activity may be ascribed to the oxide being accidentally in the state of a protoxide."†

* 'London Med. Gazette,' December, 1831.

† 'Elements of Materia Medica, &c. ii. 495.

The results of my observations have led me to conclusions identical with those of Dr. Thomson, yet I can well recollect, how strongly it was urged, by an old and venerated preceptor, to place full reliance upon six or eight grain doses of this preparation, in cases where a febrifuge was needed, and to be especially careful not to exceed this quantity, lest emesis should be induced.

In every case, in which the skin is hot and dry, and the indication appears to be, to establish diaphoresis, the cause of this condition of the capillary system must be enquired into, and, if possible, removed. Hence it is, that the well-instructed practitioner employs indirect diaphoretics rather than such as are esteemed direct. Thus, diminished sensible exhalation takes place from the skin, during the existence of fever or of inflammation, but he does not have recourse to any reputed diaphoretic, which acts by exciting the sanguiferous system. He adapts his antiphlogistic remedies, so as to reduce the already too much excited condition of the blood vessels to the healthy standard, and he finds, when he has removed the internal inflammation, the heat and dryness of the skin subside, and diaphoresis satisfactorily established. Under similar circumstances a full dose of opium is attended with a similar result. Opium, in a large dose, exerts sedative properties. When, therefore, inflammation is present, sedation is produced by the drug; nervous and sanguiferous excitation are allayed, and the skin becomes cool and moist. Hence it is, that morphine, in large doses, is often so powerfully diaphoretic.

One of the most celebrated diaphoretics, or 'sudorifics',—for the latter term is more frequently employed where the medicine is considered capable of inducing sweating—is a combination of opium with ipecacuanha. Opium, in a small dose, is a stimulant; in a large one, a sedative. Ipecacuanha, in a full dose, is an emetic; in a small one, a nauseant, and, by virtue of the latter property, a diaphoretic. Ten grains of the *pulvis ipecacuanhæ compositus*—'Dover's powder'—contain one of opium, and, under the combined action of the substances in this dose, augmented exhalation from the skin takes place, as surely as after the administration of any internal diaphoretic agent. It has been the fashion to explain its action by supposing, that, whilst the opium increases the force of the circulation, the ipecacuanha relaxes the exhalant vessels, and causes a copious diaphoresis.*

* Paris, op. cit. p. 459.

This, however, is an improbable hypothesis, and the true explanation perhaps, is,—that the combined influence of the two agents is exerted on the vascular and nervous systems, so as to reduce inordinate activity, and, in this way, the erethism of the capillaries, consequent on irritation existing elsewhere, is removed, and the cutaneous exhalation becomes manifest. It cannot be denied, that there may be remedies, which may hurry the circulation, and others that may relax the cutaneous exhalants, but it is not easy to conceive, that they can be readily brought to act simultaneously, and it is easier to account for the induction of diaphoresis, by such compound remedies as the *pulvis ipecacuanhæ compositus*, upon general principles, than by invoking specific influences, of the reality of which we must remain in strong doubt.

I have already remarked, that nauseants act as the most effective diaphoresis, but they fall under the second great class of medicinal agents—sedatives, and will be considered hereafter. Their operation is, of course, indirect; their main effect being exerted on the nervous and sanguiferous systems, which they depress.

The action of diaphoretics is aided by the free use of diluents; but much of their operation is to be referred rather to the temperature of the fluid, than to their passing into the bloodvessels, and producing polyæmia. The experiments of Magendie have shewn, that if warm fluids be injected into the veins of an animal, a state of artificial plethora may be induced, during the existence of which, the pulmonary and cutaneous transpirations are largely augmented. Where, however, there is much erethism present, absorption is but feebly effected. Were it otherwise, inflammatory affections could hardly fail to be largely augmented by the free use of diluents.

On the whole, then, even in febrile and inflammatory affections, the use of the ordinary internal diaphoretics is uncertain, and generally of no avail; whilst many of them are decidedly injurious by their excitant properties; yet, in many such cases, advantage may be derived from the equalizing influence of the warm bath; and, in many of the minor inflammations, especially of the gastro-pulmonary mucous membrane—as catarrh—the good effect of warm diluents, aided by the warmth and quietude of bed, produce an effect of equalization, which is often most salutary. In no disease, perhaps, has the class of medicines, which we are considering, been more extensively employed than in

rheumatism. Its pathology has always been connected with suppression of perspiration. Its very name, indeed, denotes a rheum,* a defluxion or catarrh, directed to the part labouring under it, and the cause of such defluxion has been almost always referred to some check given to the cutaneous transpiration. This applies more especially to chronic rheumatism, but the reasoning, and the practice founded upon it, have been extended to the acute forms of rheumatism or rheumatic fever, in which the copious exudation from the cutaneous exhalants, notwithstanding the hot skin, is one of the most striking symptoms. The Dover's powder has long been a favorite remedy in this disease, and, when given in proper doses, it is useful, for the reasons previously assigned. The combination is well adapted for diminishing vascular and nervous action; but the indication, in these cases, is surely not to restore suppressed perspiration, but rather to diminish the singular state of erethism, which characterizes this anomalous phlegmasia.

In almost all cases, in which the employment of diaphoretics appears to be indicated, the class of sedatives, or refrigerants, or both, will be found infinitely more advantageous, for reasons already assigned, and to be more particularly expatiated upon, when I come to consider the *modus operandi* of those divisions of remedial agents.

* from $\rho\epsilon\omega$ 'I flow.'

TABLE

OF THE CHIEF REPUTED DIAPHORETICS, AND THEIR OFFICIAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Ammoniae Acetatis Li- quor. <i>Solution of Acetate of</i> <i>Ammonia;</i> <i>Spirit of Mindererus.</i>	From Acid. Acet. dilat. O j. ammo- niae carbonatis lb. i.	.....	{ f. oz. $\frac{1}{2}$ to f. oz. $1\frac{1}{2}$.
Ammoniae Carbonas. <i>Carbonate of Ammo- nia.</i>	{ (See Table of Ex- citants.) }	.....	gr. 5 to 15.
Antimonialis Pulvis. <i>Antimonial Powder.</i> <i>Factitious James's</i> <i>Powder.</i> (An oxide of antimony with phosphate of lime.)	By calcining sul- phuret of antimony and hartshorn sha- vings.	.....	gr. 10 to [?]
Antimonii et Potassae Tartras. <i>Tartar Emetic.</i>	{ (See Table of Eme- tics.) }	Vinum Antimonii. (See Table of Emetics.) }	gr. $\frac{1}{8}$ to $\frac{1}{4}$. m 10 to 30.
Antimonii Sulphure- tum praecipitatum. <i>Golden Sulphur of An- timony.</i> <i>Kermes Mineral.</i>	By boiling sulphuret of antimony with a solution of potassa, and adding sufficient dilute sulphuric a- cid to precipitate.	.....	gr. 1 to 3.
Asclepias Tuberosa. <i>Butterflyweed, Pteuri- sy Root.</i> (The root of the <i>As- clepias tuberosa.</i>)— Indigenous.	.....	.....	gr. 20 to dr. 1.
Camphora. <i>Camphor.</i>	{ Sec Table of Excit- ants. }	Aqua Camphorae. (See Table of Excitants.) }	gr. 5 to 10. { f oz. $\frac{1}{4}$ to f. oz. $1\frac{1}{2}$.
		Tinctura Camphorae. (See Table of Excitants.) }	m 5 to 60.
Contraeryva. <i>Contraeryva.</i> (The root of the <i>Dor- stenia Contraeryva.</i>)	From Mexico, the W. Indies, and S. America.	.....	dr. $\frac{1}{8}$.
Dulcamara. <i>Bittersweet.</i> (The stalk of the <i>Sol- anum Dulcamara.</i>) —Indigenous and European.	.....	.....	dr. $\frac{1}{4}$ to dr. 1.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
		Decoctum Dulcamaræ. (Dulcamar. oz. 1; aq. O 1½; coque ad O j.)	f. oz. 1 to f. oz. 2
Eupatorium perfoliatum. <i>Thoroughwort.</i>	{ See Table of Tonics.	{	gr. 10 to 20.
		Infusum Eupatorii perfoliati. (See Table of Tonics.)	f. oz. ½ to f. oz. 3
Guaiaci Lignum. <i>Guaiacum Wood.</i>	{ See Table of Excitants.		
		Decoctum Guaiaci compositum. <i>Decoction of the woods.</i> (Lign. guaiac. oz. 3; uvar. passar. oz. 2; rad. sassafr. rad. glycyrr. ana oz. 1; aq. lb. 10. Boil to lb. 5.)	f. oz. 4 to f. oz. 6.
Guaiacum. <i>Guaiac.</i> (A substance sui generis;—neither gum nor resin.)	{ See Table of Excitants.	{	gr. 10 to 30.
		Tinctura Guaiaci. <i>Tincture of Guaiac.</i>	f. dr. 1 or dr. 2.
		Tinctura Guaiaci ammoniata. <i>Ammoniated Tincture of Guaiac.</i>	f. dr. 1 to dr. 2.
Ipecacuanha. } Ipecacuanha. }	{ See Table of Emetics.)	{	gr. 1 to 2.
		Pulvis Ipecacuanhæ et opii. <i>Dover's powder.</i> (Ipecac. pulv.; opii. ana dr. 1. sulphat. potass. oz. 1.)	gr. 5 to 15.
		Vinum Ipecacuanhæ. (See Table of Emetics.)	m 20 to 60.
Mezereum. <i>Mezereon.</i> (The bark of the root of the <i>Daphne Mezereum.</i>)	{ From Europe.	.....	gr. 10 to 15.
		Decoctum Mezerei. <i>Decoction of Mezereon.</i> (Cort. mezerei. dr. 2; rad. glycyrr. oz. ½. aq. O iij. Boil to O ij.)	f. oz. 3 to O ½.
Opium,— and its active principle,— Morphina.	{ (See Table of Narcotics.)	{	In a small or large dose, the preparations of opium and morphine are diaphoretic,—according to the precise condition of the system.
Sarsaparilla. } Sarsaparilla. }	{ (The root of the <i>Smilax Sarsaparilla</i> , and others.)	{	
			dr. ½ or dr. 1.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Sassafras Radicis Cortex. <i>Bark of Sassafras Root.</i> (The bark of the root of the <i>Laurus Sassafras</i> .)—Indigenous.	}	Decoctum Sarsaparillæ. (Sarsaparillæ incis. et contus. oz. 6; aq. O vi. Boil to O iv.)	f oz. 4. to O $\frac{1}{4}$.
		Decoctum Sarsaparillæ compositum. <i>Lisbon Diet Drink.</i> (Decoct. Sarsap. O iv; cort. rad. sassa; guaiac; rad. glycyrr. ana oz. 1; mezerei oz. 3. Boil for a quarter of an hour.)	f oz. 4 to O $\frac{1}{4}$.
		Extractum Sarsaparillæ. (The watery extract.)	gr. 10. to dr. 1.
		Syrupus Sarsaparillæ. (Sarsap. lb. 2; lig. guaiac. oz. 3; rosar. rubr.; sennæ; rad. glycyrr. ana oz. 2; ol. sassafr. ol. anisi. ana m 5; ol. gualtheriæ m 3; sacch. lb. 8; alcohol dilut. O 10.)	f oz. $\frac{1}{2}$, or oz. 1.
		Generally given in the form of tea.	
Serpentaria. <i>Virginia Snake Root.</i>	{ (See Table of Tonics.)	Oleum Sassafras. (The distilled oil.)	m 2 to 10.
Spiritus Ætheris Nitrici. <i>Spirit of Nitric Ether.</i> <i>Sweet Spirits of Nitric.</i>	{ By distilling a mixture of nitric acid and alcohol.	Infusum Serpentariæ. (See Table of Tonics.)	gr. 10 or 30.
			f. oz. 1 to f. oz. 2.
Sulphur. <i>Sulphur.</i> <i>Brimstone.</i>	{ { (See Table of Cathartics.)	Potassæ Sulphuretum. <i>Liver of Sulphur.</i> (Sulphur oz. 1; potassæ carb. oz. 2; melt.)	dr. 1 to dr. 3.
		Sulphur præcipitatum. <i>Lac Sulphuris.</i> <i>Milk of Sulphur.</i> (See Table of Cathartics.)	gr. 2 to 10. Used in solution as a bath in cutaneous affections.
		Unguentum Sulphuris. (Sulphur lb. 1; adipis lb. 4.)	dr. 1 to dr. 3.
		Unguentum Sulphuris compositum. (Sulphur oz. 1; hydrarg. ammoniat.; acid. benzoic. ana dr. 1, ol. linon. acid sulph. ana f dr. 1; potassæ nitrat. dr. 2; adipis lb. $\frac{1}{4}$.)	Externally, in cutaneous affections in which sulphur is employed internally.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Xanthoxylum. <i>Prickly Ash.</i> (The bark of the <i>Xan-</i> <i>thoxylum fraxine-</i> <i>um.</i>)—Indigenous.	} .....	.....	gr. 10 to 30.
Caloric.....	.....	{ Warm Air Bath. Warm Water Bath (Temp. 90° to 96°.	
Exercise.—(Active.)	.....	
Friction.....	{ (See Table of Sor- befaciants.)		

SECTION IX.

ERRHINES.*

Definition of errhines—Sternutatories—Modus operandi—Dangers of sneezing.

THIS class of medicinal agents is much less used now than formerly. There are, indeed, but few cases in which their employment can be suggested. At one time, 'errhines' were separated from 'sternutatories.'—the former comprising agents that excite an increased discharge from the schneiderian membrane; the latter those that provoke sneezing; but the class of errhines is now made to include both, under the definition—"Agents that occasion an increased discharge from the schneiderian membrane, and sneezing."

When an irritating substance is placed in contact with the schneiderian membrane, it excites a sensation, through the fifth pair of nerves, or nerves of general sensibility, distributed to the nose, which occasions the brain to call into action the appropriate muscles concerned in sneezing, in order that the source of irritation may be ejected by the anterior nares. At the same time, if the errhine remains in contact with the schneiderian membrane, a centre of fluxion is established; the follicles augment their secretion; and, if the substance be still more irritating, true inflammation is excited. This effect, of course, takes place more immediately in the part of the mucous membrane with which the errhine comes in contact; but the excitation is extended more or less to the mucous membranes, which may be regarded as continuous with that, which lines the nasal passages—as those that invest the sinuses and the ductus and nasum. In

* *Ptarmica*, *Sternutatoria*, *Apophlegmatisantia per nares*; from *εν*, 'in,' and *ριν*, the nose.

this way, we can understand, that the operation of an errhine may augment the secretion of tears, and occasion more or less suffusion of the eyes; and, conversely, that an inflamed state of the conjunctiva may give rise to increased discharge of mucus from the lining membrane of the nasal fossæ and sinuses, and to sternutation; a sense of irritation in the nose, inciting to the operation of clearing the nose, is, indeed, a common accompaniment of ophthalmia.

From what has been observed, it is clear, that if an errhine be too strong, instead of increasing the discharge from the schneiderian membrane, it may arrest even the healthy secretion. This is, indeed, one of the first effects of inflammation occurring in any mucous membrane, and it is not until the inflammation has persisted for some time, that the secretions are materially augmented.

To prevent the induction of inflammatory irritation, the more powerful errhines are always reduced, by the addition of some inert powder.

A knowledge of the *modus operandi* of this class of medicinal agents at once suggests the cases, in which they might rationally be had recourse to. They occasion a centre of fluxion in the part of the membrane, with which they are made to come in contact; a derivation of nervous and vascular action is thus effected from other parts; an increased discharge takes place from the exhalants and follicles of the nasal mucous membrane—although this has probably but little curative agency—and if they excite sternutation, a strong revulsive impression is made.

Possessed of these properties, errhines have been used in head affections in general; and especially in diseases of the eyes and ears; but still, their remedial powers are very limited, and if much sneezing be produced, they may cause more mischief than benefit. It is on this account, that they are rarely administered except in popular practice.

Physiologically, sneezing is set up to clear the nostrils from any source of irritation. It is hence often excited in the way of an external sensation—that is, by some substance impinging on the schneiderian membrane. But it often occurs, also, as an internal sensation,—that is, produced by some organic change in the mucous membrane itself. Hence, it is a symptom of inflammation of the schneiderian membrane, as in common cold, and in the catarrh that attends measles.

Dr. Thomson refers to a case of benefit from sternutation, in which it appears, however, to have been prescribed empirically. The result may be borne in mind with advantage, as it attracts attention to a cause of cephalalgia, that might otherwise have been unsuspected. A lady was afflicted with violent headache, accompanied with the sensation, well known by the term 'stuffing in the head.' Many remedies were proposed, and tried, but ineffectually. A physician was called in, who prescribed snuff, as a sternutatory. It produced violent sneezing, and the ejection, from one of the nostrils, of a plug of hardened mucus, nearly an inch long; after which she experienced immediate relief, and, in twenty-four hours, was perfectly recovered.*

From the succussion, produced during the operation of sneezing, and the compression of the abdominal viscera, it has been advised in popular practice, when torpor of the uterus exists after the extrusion of the fœtus, with the view of exciting the uterus to contraction for the delivery of the secundines; and, at times, it is successful; but an acquaintance with the physiology of sneezing will equally shew, that it may occasionally be productive of mischief, by giving rise to increased flow of blood to the head by the arteries, and to impeded return by the veins, and thus producing apoplexy, epistaxis and other head affections. The succussion, too, accompanying it, is evidently improper in pregnancy, and *a fortiori*, where there is tendency to abortion; or where hernia or aneurismal diseases exist. Conradi esteems errhines to be contra-indicated when any inflammatory condition (*entzündlicher Zustand*) is present,† but this caution is unnecessary, as it could scarcely happen, that they could be had recourse to, at least before remedies had been employed, which were considered proper for the removal of such condition.

It is probably owing to the apparent violence done to the system, and to the induction of these diseases, that the custom has so long existed, in some countries more especially, of offering a benediction to any one who sneezes. Amongst the Teutonic nations, some form of salutation is always bestowed on such occasions. Even a professor, whilst addressing his hearers, is compelled to bow to the force of custom when any of the class execute this physiological act.

*Op. citat. ii. 103. † *Handbuch der allgemeinen Therapie*; u. s. w.; s. 123.

It might here be agitated, whether the habitual use of errhines—as of snuff—is prejudicial, but this is a question, which belongs more to *hygiène* than to therapeutics, and has accordingly been investigated in another place.*

* ‘*Elements of Hygiène*,’ p. 378.

TABLE

OF THE CHIEF ERRHINES, AND THEIR OFFICINAL PREPARATIONS.

AGENT.	OBTAINED.	DOSE.
Asari Folia. <i>Asarabacca Leaves.</i> (The leaves of the <i>Asarum Europæum</i> .)	<div> <div> </div> <div>From Europe—G. Britain and the Continent.</div> </div>	gr. 1 to 2.
	<div> <div> </div> <div>Pulvis Asari compositus. (Fol. Asari, p. 3; fol. origani marjoranæ; fol. lavand. ana p. 1.)</div> </div>	gr. 5 to 6.
Euphorbiæ Gummi-Resina. <i>Euphorbium.</i> (The concrete juice of different species of Euphorbia, especially the <i>Eu. officinarum</i> .)	<div> <div> </div> <div>From Africa.....</div> </div>	<div> <div> </div> <div>1 grain mixed with wheaten flour or starch.</div> </div>
Hydrargyri Sulphas flavus. <i>Yellow Sulphate of Mercury.</i> }	(See Table of Emetics.).....	<div> <div> </div> <div>Largely diluted with wheaten flour, or starch.</div> </div>
Tabacum. <i>Tobacco.</i> (The leaves of the <i>Nicotiana Tabacum</i> .)—Indigenous.		
Veratrum Album. <i>White Hellebore.</i> (The root of the <i>Veratrum album</i> .)	<div> <div> </div> <div>From Continental Europe.</div> </div>	<div> <div> </div> <div>Diluted with wheaten flour, or starch.</div> </div>

SECTION X.

OF SIALOGOGUES.*

Definition of sialogogues—Their employment limited—Mercury as a sialogogue—Modus operandi of sialogogues.

SIALOGOGUES are agents, that increase the salivary discharge. Their general *modus operandi* is analogous to that of errhines. By their excitant properties, they irritate the lining membrane of the mouth, and the irritation, thus induced, is extended along the ducts to the salivary glands ; so that not only is the quantity of fluid, exhaled from the mucous membranes, increased, but salivation results. In this way, depletion follows the employment of sialogogues, and more or less revulsive effect supervenes, which may act beneficially on parts at a distance laboring under disease. Occasionally, also, they may prove useful, as in cases of paralysis of the muscles of the tongue, by their directly excitant properties. It is obvious, however, that they cannot be of benefit except in local palsy of the organ. Where the origin of the disease is cerebral, no advantage can be expected to accrue from them.

The employment of sialogogues must necessarily be extremely limited. They are occasionally used in toothache and in head affections,—precisely, indeed, in the circumstances, which are considered to indicate the use of substances, that excite irritation in, and increased discharge from, the lining membrane of the nasal cavities.

By some writers on Therapeutics, mercury has been ranked

* Ptyalogogues, ptyasimagogues, salivants, *apophlegmatismi seu apophlegmatizantia* per os; from *σialον*, "saliva," and *αγω*, "I expel."

amongst the sialogogues, and salivation is certainly one of the effects resulting from its copious administration. It is now, however, generally admitted, that this result is never necessary, and that it is rather to be deplored, inasmuch as the increased discharge exhausts, and irritates without producing any benefit whatever. When this potent article of the *materia medica* is duly exhibited, it induces a new action, not only in the salivary glands, but in every part of the glandular and follicular, and perhaps of the secretory, systems; and as this new action, or new disease, is incompatible with the one that may be already existing, the latter yields. In this point of view, therefore, mercury is an excitant; accordingly, it has been referred to under the head of 'excitants proper,' and the evidences—as I then remarked—that such excitant operation is exerted, are,—soreness and falling away of the gums; fœtor of the breath; tenderness, when the teeth are pressed against each other, with some degree of fever, which, in consequence of its being excited by mercury, has been termed 'mercurial.' If the practitioner can restrict the effects of the remedy to those enumerated, it is well; but frequently they will augment even after the mercury has been discontinued, until profuse salivation supervenes; but this, as I have remarked, the intelligent practitioner properly regards as an evil, which he would have prevented if practicable: it is at times, indeed, followed by great debility, and by so much nervous impressibility, or erethism, that a new disease—the 'hydrargyria'—is excited, which occasionally proves suddenly fatal, and always requires the most discriminating management. At one time, it was imagined, that the redundant mercury is passed off in the fluid of those profuse salivations; but careful chemical analysis has failed to detect the metal in it. The idea of there being any specific antisiphilitic or antifebrile virtue in mercury is now nearly exploded, and its decadency has been largely promoted by the discovery, that although mercury is well—perhaps best—adapted for the cure of siphilitic affections, when properly administered, such affections may be removed without it.

TABLE

OF THE CHIEF SIALOGOGUES.

AGENT.	OBTAINED.
<p>Armoracia. <i>Horse Radish.</i> (The fresh root of the <i>Cochlearia Armoracia.</i>)</p> <p>Calamus. <i>Sweet Flag.</i> (The root of the <i>Acorus Calamus.</i>)—Indigenous.</p> <p>Mezereum. <i>Mezereon.</i> (See Table of Diaphoretics.)</p> <p>Pyrethrum. <i>Pellitory of Spain.</i> (The root of the <i>Anthemis Pyrethrum.</i>)</p> <p>Tabacum. <i>Tobacco.</i> (The leaves of the <i>Nicotiana Tabacum.</i>)—Indigenous.</p> <p>Zingiber. <i>Ginger.</i> (The Root.)</p>	<p>} From the Levant, Barbary, &c.</p>

SECTION XI.

DIURETICS.*

Definition of diuretics—Their *modus operandi*—Mental diuretics—Therapeutical employment of diuretics—In dropsies—In various chronic diseases.

Diuretics are agents that increase the urinary discharge.

The direct diuretics are such as act immediately and specifically on the kidney, so as to increase its secretion, and to these the term is more particularly appropriated: as in other cases, however, it has been extended, so as to include any agency, that may indirectly produce diuresis. Thus, diluents may become diuretics, by increasing the mass of circulating fluid, and, of consequence, the quantity of urine;—in other words, by occasioning the elimination of that, which has been artificially introduced; and, in the same manner, a cool temperature, by diminishing the amount of the cutaneous and pulmonary depurations, may augment that which is effected by the urinary organs. If, too, any inflammatory condition of the kidneys exists, bloodletting, although it diminishes the amount of circulating fluid, may restore the diminished renal secretion: but it is unnecessary to go into the consideration of the various agencies that may prove indirectly diuretic: they will suggest themselves readily to the pathological inquirer. My object is to investigate the *modus operandi*, and applicability, of substances, that belong strictly to the class of diuretics;—of substances, which, if injected into the blood, in appropriate doses, will seek out the urinary organs, and exert on them their specific operation. I say, in appropriate doses, because many of them,—as cantharides, and turpentine,

* Uretics, from *δία*, 'through or by,' and *οὐρῶ*, 'I pass the urine.'

—if given in too great quantity, may induce nephritis, and hæmaturia, without in any manner aiding the urinary depuration.

Under ordinary circumstances, it is necessary, that a certain quantity of urea, or its elements should be separated from the blood; otherwise, disease and death may follow. Accordingly, whenever the urinary secretion is suppressed, in protracted or acute diseases, it is an unfavorable, and, in many cases, a fatal symptom, inasmuch as it exhibits a total revolution in the accomplishment of the most indispensable functions, and one not likely to admit of restoration. There are, however, anomalous cases on record, in which the urinary depuration has not taken place for years together; and, in the ‘Philosophical Transactions,’ for 1713, Dr. Richardson gives the case of a youth—seventeen years of age—who had never passed any urine, and yet suffered no inconvenience.*

Where the circumstance has resulted from malformation,—as in this last case,—we can conceive, that the function might be supplied through some other channel,—knowing, as we do, the surprising instances of succedanea, met with in certain cases of monstrosity; but it is not so easy for us to comprehend those cases, in which the depuration,—after having been established for a length of time,—has become entirely arrested, and with apparent impunity. I have already alluded to the compensation that appears to exist between the two great depurations—urinary and cutaneous. This compensation is such, that if the one be diminished, from any cause, the other is proportionably increased; and it is probable, that when the urinary depuration is diminished, some of the principles may pass off by perspiration, as urea has been detected in the fluid of the cutaneous exhalation. Perhaps, too, in those diseases, in which we are in the habit, and with propriety, of regarding suppression of the urinary secretion as a fatal symptom, the mischief arises less from the retention of matters that ought to be evacuated, than from the deranged state of the system—the complete *bouleversement* of functions—which the suppression announces.

Of the different substances, ranked under the head of diuretics, some pass into the mass of blood, and proceed to the kidneys, without experiencing any decomposition; others, on the contrary, undergo changes in the first passages, and it is the result only from such changes, that excites diuresis. To the first class be-

* See the Author’s ‘Human Physiology,’ Second Edit. ii. 271.

long—amongst other substances—potassa, dilute mineral acids, nitrate of potassa, the oils of turpentine, juniper, &c. The feaster on garlic, and asparagus is reminded, by the odour of the urine, of the kind of vegetable, that has ministered to his repast; but these last are more properly examples of the separation of the odorous principles in the first passages.

I have already referred to the opinion maintained,—that, when the acetic acid is united to potassa, a separation of the constituents takes place in the stomach, the potassa being set free, and the acetic acid digested,—and I remarked on that occasion, that as the muriatic acid exists, in a state of health, in the gastric secretions, should any such separation take place, the potassa would be laid hold of by this acid, and muriate of potassa be formed, which would enter the circulation unchanged. The same may be said of the potassa, and its alkaline fellows, when united to other vegetable acids. Our knowledge, however, on this point of animal chemistry is not very precise, and many of our ideas are probably inaccurate. This seems to be the case with the bitartrate of potassa, on which Dr. Thomson has the following remarks, when speaking of it as a diuretic. “Its effects in this respect are explained by Dr. Paris on the probability of the decomposition of the salt in *transitu*; and consequently the conveyance of the alkaline base to the kidneys. It is possible that this explanation may be correct; but when we consider that the quantity of alkali contained in the dose of the bitartrate is equal only to five grains, when a scruple of the bitartrate is taken, and that seven grains of the alkali are taken when twenty minims of the liquor potassæ are administered, yet that the effects of the bitartrate are much more considerable in producing diuresis than the liquor potassæ, there is some difficulty in assenting to the accuracy of this explanation.”*

The remarks previously indulged, regarding the salts formed by a combination of a vegetable acid with an alkaline base, apply to this salt; and, if any decomposition be effected, it must probably be through the agency of the mineral acid, which is always contained in the gastric juice. In the mode and quantity, however, in which the bitartrate of potassa is usually taken as a diuretic,—that is, in solution, in the way of common drink,—a portion probably escapes any kind of decomposition, and passes to the kidneys unchanged. In the state of solution, it is eminent-

* Op. cit. p. 422.

ly adapted for ready absorption, and therefore is enabled to pass through the coats of the bloodvessels of the stomach and duodenum, by imbibition,—in the way in which tenuous fluids readily enter the torrent of the circulation.

Of the diuretics, which are set free in the stomach,—or, in other words, separated from the substances with which they are combined,—we have marked examples in the vegetable substances, whose diuretic properties are dependent upon oil or oleoresin;—as the different turpentine, copaiba, cubebs, juniper berries, &c., and, even in cases in which essential oil is combined with resin, it is not certain, that the resin is not separated from the oil by the digestive process, whilst the latter only is taken into the circulation and proceeds to the kidney, to excite its appropriate operation. In the case, indeed, of every vegetable diuretic, a separation must take place in the stomach between the diuretic and the rest of the components; and the same applies to the only animal diuretic in the lists—the *cantharis vesicatoria*, or ‘blistering fly’,—the active principle of which—‘cantharidine’—is separated during the digestive process, and probably alone enters the circulation, and proceeds to the urinary organs.

Lastly, certain mental emotions may be regarded as diuretics; these are of the same character as the mental cathartics. They are of the depressing kind. Fear and anxiety of mind are well known agents. Dr. Thomson remarks, that various sounds and even odours operate in the same manner through the medium of the nerves, and he refers to Shakespeare, who ascribes this effect to the sound of the bagpipe—

“ And others, when the bagpipe sings i’ the nose,
Cannot contain their urine.”

But these are cases, which exhibit the influence of sensations and emotions on the power of retention rather than on that of secretion. The like result, too, is produced by the exciting emotions. Excessive joy has given rise to the same incontinence as excessive dread; a fact, well elucidated by Cervantes, in the effect, which he describes to have been produced on Sancho’s daughter, when the joyful tidings were communicated to her, that her father had been made governor of Barataria.

By occasioning a copious discharge of the more fluid portions of the blood, diuretics are, to a certain extent, evacuants, but they are rarely employed as such, unless for the purpose of giving

occasion to greater activity of absorption, as in cases where an undue exhalation or accumulation of fluid has taken place into one or more of the serous cavities. What I mean is,—that diuretics are rarely invoked as depletives, where antiphlogistics appear to be indicated. Their effect is too trivial to make any decided impression.

It is perhaps by their revulsive effect, combined with diuresis, that they act so beneficially in certain diseases. The diuresis itself is a sufficient evidence of their operation as local stimulants, even were we not aware, that nephritis or hæmaturia, or both, frequently result from their administration in too large a dose,—a fact, which it is important to bear in mind, in affections of the kidney, accompanied by inflammation and diminished urinary secretion, in which, from an attention to the latter circumstance only, their employment might seem to be indicated. In such affections, they could not fail to add to the mischief, and the best diuretics would obviously be—the lancet and the antiphlogistic medication, which, by removing the cause of the diminished secretion, would give indirect occasion to its restoration.

From what has been said, then, of the properties of diuretics, their Therapeutical employment will be very intelligible. Much benefit cannot of course, be expected from them in febrile affections, or in internal inflammations of parts at a distance from the urinary organs; and it would obviously be improper to administer any but simple diluents, where the kidney is suffering under inflammatory irritation. I have already remarked, that, as simple evacuants, not much reliance can be placed upon them, whilst we have other depletives infinitely more effective in such cases.

The chief diseases, in which diuretics are employed, are those of a dropsical character; especially of the abdomen or cellular membrane. By augmenting the secretion from the kidneys, the quantity of circulating fluid is necessarily diminished; imbibition is augmented; the fluid of the dropsy soaks through the parietes of the bloodvessels, and it can be readily understood, that, in this way, such collections may be made to disappear. It is probable, too, that a great part of the effect is dependent upon the revulsive operation of the diuretic. Acting as a local stimu-

lant to the kidney, it occasions an afflux of vital energy to the organ, and thus diminishes the too great exhalation from the vessels of the serous membrane. Reliance is, however, rarely placed upon the administration of diuretics only, in dropsy. The precise pathological condition, which gives rise to it, has to be attentively investigated, and an appropriate system of medication to be united with the diuretic. Thus, the dropsy is often manifestly of an active or sthenic character, so that bloodletting or cathartics, or both, are indicated, and, these being premised, more benefit may accrue from the diuresis than would otherwise have resulted. Frequently, in such cases, a combination of agents of another character with diuretics may be had recourse to with great advantage. Mercury, as we have seen, is an excitant of the secretory system; squill is a diuretic; their conjoint action will, therefore, be as follows:—the mercury produces an action of revulsion,—a distraction of vital manifestation from the seat of the dropsical affection to the parts on which it exerts its local stimulation,—the exhalation from the serous membrane is consequently reduced even below the healthy point; a similar influence is exerted by the local stimulation of the diuretic, whilst, in addition, under its operation the absorbed fluid is discharged. Hence, a combination of mercury with digitalis, squill, or some other diuretic, is one of the most useful and most common prescriptions in dropsical cases.

It is obvious, however, that diuretics can never be productive of essential benefit, where organic mischief exists in any of the viscera. Impeded circulation in the viscera gives occasion, indeed, to the worst forms of dropsy, as the visceral mischief does not usually admit of remedy. Of this nature is the organic disease of the kidney, to which attention was originally directed by Dr. Bright, in the first volume of his ‘Reports,’* and which is distinguished by the coagulable state of the urine. This is often accompanied by dropsy, although not always. An interesting case of this kind of renal disease fell recently under the charge of my friend Dr. Gibson, of Baltimore, and myself. It occurred in an excellent medical officer of the army, who had long suffered under distressing irritability of the bladder, with occasional pain in the region of both kidneys; and, on one or two occasions, with severe nephritic symptoms, which yielded

* ‘Reports of medical cases selected with a view of illustrating the symptoms and cure of diseases by a reference to morbid anatomy.’ Lond. 1827. 4to.

to appropriate measures. A tumor gradually arose in the right lumbar region, which could be distinctly felt on pressing the corresponding part of the abdomen, but its connexion was so darkly defined as to occasion great obscurity in the minds of many intelligent practitioners whom he had consulted. By most, indeed, the irritability of the bladder was supposed to be unconnected with the tumor, and the mischief was presumed to be vesical rather than renal. He had been several times sounded, but no calculus was found in the bladder. When Dr. Gibson and myself saw him in the course of the last winter, he was passing a large quantity of albumen with his urine, which was made palpable on holding it in a spoon over a candle. At times the quantity was so great as to astonish us. This circumstance, with the diminished specific gravity of the urine, impelled us to refer the main—if not the whole—mischief to the kidneys ;—to consider, in other words, that the disease was in the organ that *secreted*, not in the one that *retained*, the urine ; and we felt satisfied from a comparison of all the evidence, that the tumor belonged to, or was connected with, the right kidney. Impressed with these views the patient was put upon a palliative treatment,—every thing being carefully prohibited that could irritate the kidneys. He was advised to try the effect of change of air, with which view he visited the Trans-Alleghany springs of Virginia, but the effects of organic irritation exhibited themselves with greater and greater intensity so as to induce him ultimately to return to Georgetown, where he expired under symptoms of gastric, and cerebral derangement. No dropsy, however, supervened, as might have been anticipated ; and as, indeed, might have happened, had his malady been longer protracted.

On dissection, the tumor was found to consist of the right kidney extensively diseased ; and containing a multitude of hydatids. The left kidney, too, was in a pathological condition, and had calculi imbedded in it ; but the bladder, although contracted, was healthy ; the whole of the distressing irritation in that organ—which prevented him from remaining, for the latter part of his existence, more than fifteen or twenty minutes undisturbed in bed—being symptomatic of the renal mischief.*

* Since the text was written—indeed this very day (Feb. 20th 1836),—I have had an opportunity of investigating, by dissection, a deeply interesting case—in its social as well as pathological relations. Early in December last, I was requested by my friend Professor Hall, of the University of Maryland, to visit with him the wife of an amiable and intelligent physician, who had resided for some time in a malarious region of Virginia, and, whilst there, had been attacked with the endemic of the country, which had left behind it

It may be proper to remark here, that in such cases, as well as in those of dropsy, where the urine is albuminous, when it is also acid, the urine ceases to present the albuminous character, after the patient has taken alkaline remedies for a short time. It would seem from experiments, instituted by Dr. G. Burrows, and referred to in his 'Gulstonian lectures,' for 1834, that when alkalies are added to urine in which the albumen has been coagula-

a manifest enlargement of the spleen. During her visit to her family in Baltimore, and when advanced six months in uterogestation, she was attacked with symptoms of severe thoracic and abdominal mischief, somewhat paroxysmal in their character, which yielded so much to appropriate management, that—although the greatest immediate danger had been apprehended—in about ten days, it seemed to be unnecessary for me to continue my attendance. From this period I heard nothing more of her, until a week prior to her dissolution, when I was again requested to visit her, two days after her delivery, which had been somewhat premature. She was then labouring under great pulmonary and cardiac distress,—the heart being evidently in a state of hypertrophy. She was so much enfeebled, however, that auscultation was postponed, and could not subsequently be practised.

On examining the right side of the abdomen, in which pain was experienced, especially on change of posture, a large tumor was found extending from the hypochondriac region as far as the pelvis. The umbilical margin of this tumor could be felt distinctly lobated,—communicating a sensation to the fingers, as Professor Hall remarked, as if it were shaped like a cactus. This tumor was more perceptible in some positions of the patient than in others, evidently changing its seat in the abdomen. On examining the urine, it was found to be loaded with albumen; and its specific gravity was not more than 1019. Taking these circumstances into consideration, with the fact that in a fall from a horse some years previously, she had injured the right lumbar region; and that, although she had not experienced any prominent or protracted signs of renal or vesical irritation, she had been occasionally affected with severe pain in the lumbar region, and with some uneasiness in passing the urine, we had very little hesitation in referring the tumor to the right kidney; and, under the whole aspect of the case, in regarding it hopeless, and demanding palliative management only. From the time of my first visit, she gradually sank, until the period of her dissolution.

On opening the abdomen, we were surprised to discover, that the tumor of the right side was an enlarged spleen, which had broken away from its attachments, and was resting with its convex surface on the brim of the pelvis,—the lower extremity of the organ being turned up, so as to attain the right lumbar region. It was suspended by its peritoneal and vascular attachments, but could be moved freely in any direction. On extending our investigations to the kidneys, we found the left greatly hypertrophied,—nearly four times the natural size,—mottled on its surface,—the cortical substance granular,—and the tubular discolored in parts, and evidently diseased: the pelvis of the organ enlarged, and the parietes of the ureter hypertrophied. The right kidney was healthy. In the thorax, the heart was found in a state of hypertrophy; and the right lung completely atrophied,—its place being occupied by a purulent or sero-purulent secretion, which completely filled the cavity of the pleura.

From what we know of the connection between this disease of the kidney and dropsy; are we to presume, that the primary lesion was seated in that organ; and that the morbid secretion into the pleura—first perhaps serous, and afterwards purulent—was induced by it? The accumulation must evidently have taken a considerable time to form; the atrophy of the lung being probably caused by the pressure of the fluid; and this atrophy could not have been effected except under protracted compression. During the attack in December, we were apprehensive, that the inflammation of the pleura might end in effusion; and it is not improbable, that during the period, which elapsed between that attack and the final exacerbation of the complaint, chronic inflammation was going on in the investing membrane, accompanied by the secretion in question.

In so young an individual—she was only twenty-five years of age—it is rare to meet with such a combination of organic lesions, almost any one of which might have placed her far beyond the resources of art.

ted by heat, they possess the power of redissolving it, and if added to albuminous urine, before exposure to heat, the albumen is not coagulated when heat is applied. He is therefore disposed to assume, that alkalies, when administered to persons having albuminous urine, produce their effects by rendering the albumen more soluble, which prevents its being detected by the application of heat.

There is at times, by the way, considerable obscurity in the detection of other renal affections, besides the cases to which I have just referred. It is by no means uncommon for the symptoms caused by the passage of a renal calculus along the ureter, to be mistaken for an attack of bilious colic. The pain of both is excruciating, and although the latter is chiefly on one side of the abdomen, and generally accompanied with more or less retraction of the testicle of the corresponding side, and numbness of the corresponding thigh, the last symptoms are at times absent, and it may not be until the pain has evidently subsided, and a small calculus has been passed, that the true nature of the affection is unfolded.

Diuretics have been frequently recommended in various chronic diseases, especially of a rheumatic and cutaneous nature; and we can comprehend how they may operate in a salutary manner, by virtue of the new action, or the revulsion they induce; but they are extremely precarious, and not generally to be relied upon. Perhaps, in chronic cutaneous affections they act less upon the kidney, than upon the blood circulating in the capillaries, the modified character of which impresses a new action on those vessels. In lumbago, and sciatica, the oils of the different terebinthines, as well as the terebinthines themselves, have been much used, and, at times, with marked advantage, but their *modus operandi* is probably altogether counter-irritant, not in consequence of the diuresis they occasion.

On the whole, therefore, the class of diuretics, although often invoked by the practitioner, cannot be considered to comprise our most efficacious agents in the management of disease. They are applicable to but few morbid conditions, and many of these can be as well treated by other remedies. Accordingly, they are by no means as often employed at the present day as they were formerly.

TABLE

OF THE CHIEF DIURETICS AND THEIR FORMS OF PREPARATION.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Cantharis. <i>Spanish Fly.</i> (The <i>Cantharis vesicatoria</i> .) Active Principle.— <i>Cantharidine.</i>	From Spain, Italy, and the south of France.	.....	gr. 1 to 2.
		Tinctura Cantharidis. (Cantharid. dr. 3; alcohol. dilut. O ij.)	} m 15 to 60.
Cantharis vittata. <i>Potatoe Fly.</i> Native of the United States. (Virtues the same as those of the <i>Cantha-</i> <i>ris</i> .)			
Chiococca vel Cahin- ca. <i>Cahinca.</i> <i>Kahinha.</i> (The bark of the root of the <i>Chiococca racemosa</i> , <i>Ch. angui-</i> <i>fuga</i> , and <i>Ch. densi-</i> <i>folia</i> .)	From S. America.	.....	scr. 1 to dr. 1.
		Extractum Chiococcæ. (The watery extract.)	} gr. 10 to 30.
Colchici Radix. <i>Meadow Saffron Root.</i> (The bulb of the <i>Col-</i> <i>chicum autumnale</i> .) Active principle,— <i>Veratrine.</i>	From Europe.	.....	gr. 2 to 8.
		Acetum Colchici. (Rad. colchic. oz. 2; aceti. distillat. O ij; alcohol. f. oz. 1.)	} m 30 to f. dr. } 1.
		Syrupus Colchici. (Acet. colchic. O j; sacch. lb. 2.)	} f. dr. to f. } oz. $\frac{1}{2}$.
		Vinum Colchici Radicis. (Rad. colchic. lb. $\frac{1}{4}$; vini O j.)	} m 15 to f. dr. 1
Colehici Semen. <i>Meadow Saffron Seed.</i> Active principle,— <i>Veratrine.</i>	.....	.....	gr. 2 to 8.
		Vinum Colchici Seminis. (Colchic. sem. oz. 1; vin. O j.)	} f. dr. 1 or dr. } 2.
Digitalis. <i>Foxglove.</i> (The leaves of the <i>Di-</i> <i>gitalis purpurea</i> .) Active principle,— <i>Di-</i> <i>gitaine</i> .)	From Europe.	.....	gr. 1.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
		Infusum Digitalis. (Digitalis dr. 1; aq. bull. O $\frac{1}{4}$. adde Tinct. Cinnam. f. oz. 1.)	} oz. $\frac{1}{4}$.
		Tinctura Digitalis. (Digital. oz. 4.; alcohol. dilut. O ij.)	} m 10.
Diosma Crenata. Buchu. Buchu Leaves. (The leaves of the <i>Diosma crenata</i> —the <i>Agathosma crenatum</i> .)			gr. 20 to 30.
		Infusum Buchu. (Fol. buchu oz. $\frac{1}{2}$; aq. bull. O $\frac{1}{2}$.)	} f. oz. 1 to f. oz. 2.
Juniperus. Juniper. (The berries of the <i>Juniperus communis</i> .)			dr. 1 or dr. 2.
		Generally in infusion—oz. 1. of the berries to O j. of water.	} f. oz. $1\frac{1}{2}$ to f. oz. 3.
		Oleum Juniperi. } (The distilled oil.) }	gr. 5 to 15.
		Spiritus Juniperi compositus. (Bacc. junip. lb. 1; sem. carui, sem. foenic. ana oz. $1\frac{1}{2}$; alcohol. dilut. cong.; aq. q. s.—Distil a gallon.)	} f. dr. 1 to f. oz. $\frac{1}{4}$.
Oleum Terebinthinæ. Oil of Turpentine. (See Table of <i>Anthelmintics</i> .)			m 5 to 30.
Potassæ Acetas. Sal Diureticus. Acetate of Potassa. (See Table of <i>Cathartics</i> .)			scr. 1 to dr. 1.
Potassæ Liquor. Solution of Potassa. Soap Ley.		(From a mixture of the carbonate of potassa, fresh burnt lime, and boiling distilled water.)	m 10 to 30.
Potassæ Nitræs. Nitrate of Potassa. Nitro—Saltpetre.			gr. 5 to 30.
Potassæ Supertartras. Cream of Tartar. Bitartrate of Potassa. (See Table of <i>Cathartics</i> .)			} oz. 1. in the 24 hours, in solution.
Scilla. Squill. (See Table of <i>Emetics</i> .)			gr. 1.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
		Acetum Scillæ.	m 30 to dr. 1½.
		Tinctura Scillæ. Tincture of Squills. }	m 10 to 30.
Sodæ Sales. Salts of Soda. (See Table of Cathar- tics.) }	{ Most of these, in small dos- es, are diure- tic, as well as the salts of potassa.
Spiritus Ætheris Ni- trici. Spirit of Nitric Ether. (See Table of Dia- phoretics.) }	
			m 20 to 60.

SECTION XII.

EXPECTORANTS.*

Definition of expectorants—Organs on which they act—Modus operandi
—Are indirect agents only—Inhalations.

EXPECTORANTS are usually defined to be—"Agents, that promote the excretion of mucus and other fluids from the lungs and air passages."

To understand, whether we are possessed of any substances that exert a specific action of this kind, let us inquire into the constitution of the bronchial tubes, and into the mode, in which reputed expectorants may affect them.

The whole of the larynx, the trachea, and probably the bronchial tubes, are lined by a mucous membrane, whose office it is to secrete mucus, and to serve the purpose of the mucous membranes in general. From this membrane it is, that the humor of expectoration is secreted. Surrounding the air tubes, probably even in their minutest division, is a contractile coat, which has an important agency in the phenomenon of expectoration. In the trachea, an obvious muscular structure exists in its posterior third, where the cartilages are wanting. It consists of a thin, muscular plane, the fibres of which pass transversely between the interrupted extremities of the cartilaginous rings of the trachea, and bronchi. The use of this muscular tissue, as suggested by Dr. Physick, and, since him, by Cruveilhier, Sir Charles Bell, and others, is to diminish the calibre of the air tubes in expectoration; so that the air, having to pass through the contracted portion with greater velocity, its momentum may remove the secretions, that are adherent to the mucous membrane. The phenomena of asthma, as Laennec has correct-

* Anacathartics,—from *ex*, 'out of,' and *pectus*, 'the chest.'

ly observed, occasionally exhibit a manifest temporary constriction of the minute bronchial ramifications; affording, indeed, every evidence of a spasmodic attack,—the essential cause being probably seated in the ramifications of the pneumogastric nerves, distributed to the bronchial tubes, whilst, at other times, the phenomena indicate rather a paralyzed than a spasmodic condition of the fibres.*

I have said, that the bronchial mucous membrane is the seat of the secretion of the matter of expectoration. The quantity, and facility with which this is secreted, must, therefore, depend upon the condition of this membrane. Occasionally, indeed, the sputum is derived from the breaking down of tubercles, or from positive abscesses in the lungs, but these are not the most common cases in which expectorants are employed;—such, at least, as are regarded to exert a specific agency on the lining membrane of the air passages, when taken into the stomach, or introduced, in any manner, into the circulation. If the bronchial mucous membrane be inflamed, as in acute bronchitis, the secretion from it may be wholly arrested for a time, after which it may become augmented, as in cases of inflammation of the mucous membranes in general; or, if the inflammation be to a less extent, and protracted, a profuse secretion may take place from it, attended with every symptom of general asthenia, as in some of the cases of winter-cough or chronic bronchitis of old people. Now, in these different conditions of the mucous membrane, a different condition of expectorant medication may be demanded. In the former, marked by every sign of internal inflammation, the antiphlogistic plan of management is imperiously required; whilst in the latter, depletion is by no means indicated, and, on the other hand, general and local excitants may be found advisable. These, however, are indirect agents—indirect expectorants—adapted for the removal of the condition of the system, which gives rise to the diminished or augmented secretion from the bronchial mucous membrane.

Again, when the sputa are secreted, they often adhere to the membrane, and are expelled with difficulty; at times, in consequence of the inflammatory condition, above mentioned, not admitting of their ready detachment; and, at others, owing to a want of due vigor in the system in general, and in the muscles, concerned in expectoration, in particular. In the former case,

* 'Human Physiology,' Second Edit. ii. 36.

antiphlogistics, nauseants, &c., become indirect expectorants; in the latter, substances, which, like ammoniacum, myrrh, and the different balsams, are excitants; or, again, agents, that are capable of exciting emesis, during the succussion accompanying which operation, the mucus becomes detached, and its expulsion favored. In these cases, a nauseating emetic is most beneficial, if inflammatory irritation exists to any extent; as, during the nausea, which precedes emesis, the secretion from the bronchial mucous membrane is favored, and the act of vomiting succeeding to the secretion, the mucus is readily detached, and expectorated. In this way, consequently, nauseants and emetics become expectorants.

All these, however, are indirect agencies only. Let us inquire, whether there are any such remedies as direct expectorants, or, in other words, any agents that act on the bronchial mucous membrane specifically, or by preference, after having been received into the stomach, and having entered the mass of blood; for, it is manifest, that this is the only mode in which any internal expectorant can come in contact with the seat of the mischief. The expectorant, whatever it may be, must be received into the circulation, either by imbibition through the coats of the gastro-intestinal bloodvessels, or through the chyloferous vessels. In either case, it must proceed to the heart, and pass with the blood of the bronchial artery to the bronchial mucous membrane. Now, although it cannot be denied, that many local stimulants, when received into the bloodvessels, do affect the particular parts of the frame on which they act by preference, we have no sufficient reason for the belief, that this is the case with any one of the remedies, that are reputed to be expectorants. None of them appear to affect the bronchial mucous membrane by preference: they exert upon it an indirect agency only.

An attentive examination of the properties, ascribed to the different agents, ranked under this division, can scarcely fail to lead the intelligent Therapeutist to the deductions of Paris. "If the term *expectorant*," he remarks, "be intended to express a medicinal substance, which has the power of promoting the expulsion of fluid from the lungs, by some *specific action* on the parts concerned, we can have no hesitation in at once rejecting the word, and denying the existence of such remedies: if, however, the term be received conventionally, as comprehending all those substances, which are capable, according to the state of the system in each particular case, of producing expectoration, it

will be extremely proper to recognize, and particularly useful to retain, such a class of medicinal agents.”*

This is the only view, that can be rationally maintained, and much careful discrimination, accordingly, becomes necessary to determine upon the precise kind of indirect agency that may be demanded in any particular case; whilst immense mischief has been done by the promiscuous prescription of reputed expectorants, under circumstances contra-indicating their employment. The pathology of many of the varieties of cough has been but little attended to, until of late years. Its identity with bronchitis was not suspected, or, if suspected, disregarded. Expectorants, in such cases, were freely administered, that is, substances considered to be possessed of direct powers over the parts concerned in the formation of the matter of expectoration, and as almost all these remedies belonged to the class of excitants, it can be seen, that mischief must frequently have followed their administration. This, every practitioner must have witnessed from the injudicious use of stimulating cough mixtures, often administered when the system has been laboring under general febrile indisposition, connected with, or dependent upon, the bronchitic cough, for which the expectorant was originally recommended. The best practitioners, in such cases, whilst they are paying proper attention to the febrile and inflammatory symptoms, generally restrict themselves, as far as may be, to the employment of demulcents. These, by passing over the top of the larynx, soothe the mucous membrane with which they come in contact, and, by continuous sympathy, the soothing influence is propagated to the part of the bronchial mucous membrane laboring under irritation.

Squill, in some form, is one of the most common expectorants in popular use. Like garlic, and the onion, it is an excitant; and, consequently, its indiscriminate use cannot fail to do mischief. Yet, if given in large quantity, it may be less prejudicial than in small, because, in an appropriate dose, it excites nausea, which is a state of diminished action. It is, perhaps, by a preponderance of the nauseant property, that ‘Coxe’s Hive Syrup’ is comparatively devoid of noxious influence in cases of violent tracheal and bronchial inflammation. It is the *Mel scillæ compositum* of the pharmacopœia of the United States, and consists of squill, seneka, tartrate of antimony and potassa, clarified

* ‘Pharmacologia,’ p. 102.

honey, and water. It is, in my mind, doubtful, whether the two first articles are possessed of any beneficial agency, in a large majority of cases in which the syrup is administered, and found useful. It is a common popular emetic in cases of croup or tracheitis, and in infantile catarrh; but, I agree with Drs. Wood and Bache,* that a simple solution of tartar emetic in water is preferable. In the action of this last there is nothing equivocal. It is a pure nauseating emetic; whilst the squill is certainly excitant in a small dose, and the same may be said of the seneka.

It is clear, then, that almost every division of medicinal agents may become expectorant, according to the precise condition of the system generally, or of the pulmonary organs particularly; and hence we equally find an expectorant effect from depletives, and from tonics and excitants; from narcotics and from counter-irritants, nauseants and emetics.

But, although we may doubt the existence of any internal expectorant—acting through the stomach and the circulation on the lining membrane of the air passages—we have a mode of exhibiting remedies, so that they may come into immediate contact with the bronchial mucous membrane, so as to modify its functions effectively. I allude to the introduction of different agents by ‘inhalation.’ In this way, soothing or relaxing vapors may be made to act upon the inflamed membrane, especially after the violence of inflammatory action has been previously somewhat subdued by appropriate antiphlogistics; accordingly, under such circumstances, the vapor of hot water is employed with much advantage, and, in cases of asthma, relief is occasionally obtained by the addition of some volatile oil, as happens in inhaling the vapor from a hot infusion of chamomile flowers. With the same view, ether is occasionally added. In some cases of asthma, there appears to be a condition of the pneumogastric nerves somewhat resembling paralysis, which stimulants, introduced in the manner referred to, are as well adapted to remove as any other agents. The vapors of burning substances, as of tar and resin, are occasionally inhaled, and they may be employed with advantage in chronic bronchitis, when the inflammation is of an asthenic character, or when the activity of the inflammation has passed away, and the copious secretion from the membrane is the most annoying symptom. The vapors of boiling tar were, at one time, strongly recommended by Sir A. Crichton, in cases of

* ‘Dispensatory of the U. States of America,’ First Edit. p. 891.

consumption, but experience has shewn, that not much reliance can be placed upon them in that fatal malady ; and many of the cases of benefit, derived from such inhalation, have probably been of the kind just referred to—cases of chronic bronchitis.

The practice of smoking the roots of stramonium in asthma, and other pulmonary affections, has long existed, and frequently essential benefit is derived from it. There is something inexplicably capricious in this singular disease. Whilst one asthmatic cannot sleep in town ; another cannot remain in the country. A friend of mine, a most respectable inhabitant of this city, (Baltimore,) is unable to sleep at his country house, which is not more than a mile and a half from the centre of the town. He has tried the experiment frequently, and the result has been always the same. I know another individual, who cannot exist in the impure atmosphere of towns. Others, again, prefer a dry, whilst many breathe more freely in a moist atmosphere. The same thing, of course, applies to medicinal agents inhaled by the lungs. Tobacco relieves some, and aggravates the symptoms of others ; but the smoke of stramonium agrees with a large majority of persons, and at times affords most manifest relief. When suffering under a severe attack of the disease, the gentleman, above referred to—as unable to sleep in the country—has frequently made manifest to his medical attendant the relief he derives from its inhalation. For this purpose, he employs the dried stalk. Others use the root, and others the leaves only.

It is, too, in the way of inhalation, that the different gases have been used therapeutically. They were first proposed by the enthusiastic Beddoes, and are certainly capable of affecting the frame—some as excitants, others as sedatives—but difficulties, connected with their efficient administration, and uncertainty in the results obtained, have led to their almost total abandonment. They pass through the bronchial tubes, penetrate the bloodvessels by imbibition, and exert their appropriate agency, either on the nerves distributed to the bloodvessels, or affect the great nervous centres, by reaching them through the circulatory current ; but such agents cannot be ranked as expectorants.

TABLE

OF THE CHIEF REPUTED EXPECTORANTS, AND THEIR OFFICINAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Ammoniacum. <i>Ammoniac.</i> (The concrete juice of the <i>Heracleum gum- miferum.</i>) A Gum-Resin.	} From Persia, Ara- bia, &c.	.....	gr. 10 to 30.
		Mistura Ammoniaci. Lac Ammoniaci. (Ammoniac. dr. 2; aq. O $\frac{1}{4}$.)	f. oz. $\frac{1}{4}$ to oz. 1.
Assafœtida. <i>Assafetida.</i> See Table of Antispas- modics.	}	.....	gr. 10 to 20.
Galbanum. <i>Galbanum.</i> See Table of Antispas- modics.		.....	gr. 10 to 20.
Inhalationes. } <i>Inhalations.</i> }	}	Of <i>Acetic Acid</i> . (Extracted from hot dilute vine- gar.)	
		Of <i>Ammonia</i> and <i>Carbonate</i> of <i>Ammonia</i> . (Largely diluted with air.)	
		Of <i>Benzoic Acid</i> . (Benzoin boiled with water, and the vapor inhaled.)	
		Of <i>Chlorine</i> . (Extricated from the saturated aque- ous solution of the gas, by the aid of hot water or a spirit lamp.)	
		Of <i>Iodine</i> . (Given off from a mixture of iodine and water, to which heat is appli- ed.)	
		Of <i>Stramonium</i> . (The dried root, herb, and seeds, smoked.)	
		Of <i>Tar</i> . (The vapor of boiling tar.)	
		Of <i>Burning Wool</i> . (That which has not been dressed.)	
		Of <i>Tobacco</i> . (The leaves smoked.)	

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Ipecacuanha. <i>Ipecacuanha</i> . (And Nauseants in general.) See Tables of Emetics and Nauseants.	{	{ gr. 2. repeated so as to excite nausea.
Myroxylon. <i>Balsam of Peru</i> . (The juice of the <i>Myroxylon Peruiferum</i> .)		From S. America..		f. dr. $\frac{1}{2}$.
Myrrha. <i>Myrrh</i> . (The concrete juice of the <i>Balsamodendron Myrrha</i> . A Gum-resin.)	{	From India and the Levant.	gr. 10 or 30.
		Tinctura Myrrhæ. <i>Tincture of Myrrh</i> . (Myrrh. oz. 4. alcohol O iij.)	{ f. dr. $\frac{1}{4}$ to f. dr. 1.
Scilla. <i>Squill</i> . See Table of Emetics.	{	
		Acetum Scillæ— <i>Vinegar of Squills</i> . Mel Scillæ compositum.— <i>Hive Syrup</i> . Oxymel Scillæ— <i>Oxymel of Squill</i> . Pilulæ Scillæ compositæ— <i>Compound Squill Pill</i> . Syrupus Scillæ— <i>Syrup of Squill</i> . Tinct. Scillæ— <i>Tincture of Squill</i> .	m 30 to f. dr. 2. m 20 or 30. f. dr. 1 to f. dr. 2. gr. 5 to 10. f. dr. 1. m 10 to 20.
Senega. <i>Seneka</i> . (The root of the <i>Polygala Senega</i> .) Indigenous. (See Table of Diuretics.)	{	gr. 10 to 20.
		Syrupus Senegæ. <i>Syrup of Seneka</i> .	{ f. dr. 1 or f. dr. 2.
Tolutanum. <i>Tolu</i> . (The juice of the <i>Myroxylon Toluiferum</i> .)	{	From S. America..	gr. 10 to 30.
		Tinctura Tolutani. <i>Tincture of Tolu</i> . (Tolut. oz. 3.; alcohol. O ij.)	{ f. dr. 1 or f. dr. 2.

SECTION XIII.

SORBEFACIENTS.*

Definition of sorbefacients—Physiology of nutrition—Absorption, how effected—Of hypertrophies—Therapeutical application of sorbefacients—Mental sorbefacients—Exercise, pressure, friction, &c.

THE class of sorbefacients has been admitted by few writers on Therapeutics. It appears to me, however, to be necessary in order to explain the operation of a multitude of medicinal agents. They may be defined—Agents that promote absorption: for, however it may be accomplished, the result of their successful operation is to give occasion to the taking up of that, which has been deposited.

To understand the mode, in which their agency is exerted, it will be requisite to inquire briefly into some of the phenomena of absorption, and nutrition. In another work,† I have entered, at length, into the consideration of absorption, of which there are three great varieties—that which is exerted by the skin and mucous membranes, and which, of course, includes chylosis,—that which is effected upon secreted fluids, which are termed ‘recrementital,’ or, in other words, which are required to pass again into the mass of blood;—and that which is concerned in the taking up of solid parts, in the function of nutrition.

Every argument induces the belief, that from the commencement of existence until its final cessation, perpetual changes are taking place—both of absorption and deposition—which affect the decomposition and renovation of each organ, as well as of the different recrementital fluids of the economy. The precise character of the apparatus, by which nutrition—as this impor-

* From ‘sorbere,’ to suck in; and ‘facere,’ to make.

† ‘Human Physiology,’ ii. 1.

tant function has been termed—is accomplished, we have no means of knowing. All admit, that the old matter must be directly or indirectly taken up by absorbents, and the new be deposited by arteries; but, as the precise arrangement of these minute arteries, and absorbents, is imperceptible to the eye, even when aided by optical instruments, their disposition has given occasion to much controversy. The generality of anatomists and physiologists conceive deposition to be effected by the minute arterial ramifications; but some presume, that inconceivably small vessels are given off from the capillary arteries, which constitute a distinct order, and whose function it is to exhale the nutritive deposit. Hence, these vessels have been termed ‘exhalants’ or ‘nutritive exhalants,’ although, when the term is used by writers, they do not always pledge themselves to the existence of any distinct set of vessels, but merely mean by it—the capillary vessel, whatever may be its nature, which is the agent of nutrition, and separates from the blood, bone where bone is needed; muscle, tendon, ligament, &c., as the case may be.

A like discordance has existed regarding the precise agents of decomposition. All admit, as we have seen, that the absorbents receive the product of absorption, but all do not conceive, that the action of taking up solid parts is accomplished immediately by the absorbents. Some, indeed, believe, that there is a kind of spongy tissue, which they term, somewhat unmeaningly, a ‘parenchyma,’ and that this sponge is situated at the extremities of the lymphatic vessels: they affirm, that it is a vital sponge or vital parenchyma,—absorbing, in other words, by virtue of the vital properties residing in it; but they maintain that the solid parts of the body are broken down by the same agents—the extreme arteries—which secreted them; and, that, being reduced to the proper fluid condition, they are imbibed by the sponge, and transmitted into the lymphatics.

I have elsewhere shewn, that all this arrangement is supposititious, and that we know not positively how the exhalants and absorbents are disposed in the capillary system. Independently of anatomical considerations, it does not seem probable, that the same vessels are endowed with antagonizing powers,—both of pulling down, and of building up; although it is not improbable, that the texture of a part to be absorbed may be modified by the secretion of some fluid, as we know to be the case, when adventitious coagula are removed from the brain. The cellular tissue, according to Serres, condensed by the pressure, forms a mem-

brane surrounding the coagulum. It then secretes a fluid, which reduces the coagulum to the liquid state, so that it can be absorbed. An attentive examination of the functions of absorption and nutrition exhibit clearly to my mind,—that the chyliferous and lymphatic vessels form only chyle and lymph, respectively, refusing the admission of every other substance; that the veins admit every liquid, which possesses the necessary tenuity, and that, whilst all the absorptions—which require the substance acted upon to be decomposed and transformed—are effected by the chyliferous and lymphatic vessels, those that require no alteration are accomplished directly through the coats of the veins by imbibition.

The agents to which I refer the absorption of decomposition, or—what has been termed—‘interstitial’ or ‘organic’ absorption, can, therefore, be readily deduced. As it is exerted on solids, and as these cannot pass through the coats of the vessels, in their solid condition, it follows, that other agents than the veins must accomplish the process; and, again, as we never find, in the lymphatic vessels, any thing but lymph, and as we have every reason to believe, that an action of selection is exerted at their extremities, similar to that of the chyliferous vessels on the heterogeneous substances exposed to them, we naturally look to the lymphatics as the sole organs concerned in the absorption of solids.

With regard to the absorption of recremental humors, less difficulty exists. Where they possess the necessary tenuity, they may pass into the bloodvessels by imbibition, or they may be taken up by the lymphatics, and conveyed into the circulation.

It is obvious, that, in the case of all these fluids, a nice balance must exist, between the quantity exhaled and that which is taken up again by the absorbents, and if, from any cause, the balance should be destroyed, so that the exhalants are in a state of superexcitation,—or the absorbents in a state of diminished action, whilst the exhalation is healthy,—accumulation of fluid may arise; and hence, the dropsical effusions into serous or cellular cavities—constituting hydrothorax, hydrops pericardii, ascites, &c.—may either be of an active or more passive kind, and the treatment may have to be essentially modified accordingly.

But these—as I have before observed—are not the only causes that give rise to such accumulations. A viscus of the thorax or abdomen may, from protracted irritation, become engorged, indurated, or obstructed, and, from this mechanical cause, the cir-

ulation through it may be impeded. Accumulation of blood in the vessels—in other words, turgescence or congestion, supervenes; and the watery portions transude. These are the worst kind of dropsies, because they arise from organic mischief, which does not itself admit perhaps of cure.

I have before observed, that the activity of absorption is much modified by the state of repletion, or the contrary, of the vessels, as well as by the state of the vessels themselves, as regards the presence or absence of excitement. If fluid be forced into the bloodvessels, so as to induce artificial plethora, and any absorbable fluid be thrown into the cavity of the peritoneum of a living animal, absorption is apparently null, or, at least, imperceptible; but if bloodletting be practised, so as to diminish considerably the amount of the circulatory fluid, the liquid, thrown into the cavity of the peritoneum, will be seen to disappear gradually, as the blood is withdrawn. Hence, we infer, that bloodletting must be an important remedial agent in many cases of dropsy; and the same remark applies, although to a less extent, to every kind of depleting agent.

That the energy of absorption is materially modified by the condition of the absorbing surface is well exemplified, as Professor Jackson has properly observed, in the congestions, and consequent remora of the circulation, so frequently existing in the gastro-intestinal mucous membrane in the advanced period of fevers, in which “medicinal substances, and remedies addressed to that surface, fail to produce their effects. Patients in this state cannot be salivated, the mercurial medicine remains on the surface to which it is applied; stimulants, diuretics, diaphoretics, disappoint of their expected operation. Even fluids cease often to be absorbed, and accumulate in the stomach and intestines, where they are found with the remedies administered before death.”*

The same fact is signally exhibited in malignant cholera,—a disease, which consists essentially of erethism of the mucous membrane of the intestines. In this state, it is impossible to produce absorption by any agency—in the advanced stages of the disease at least—and hence, it has been proposed to throw fluids immediately into the mass of blood by injection,—a remedy, which has not, however, fulfilled all the ends, that were at one time, somewhat extravagantly, expected from it.

In cases of hypertrophy of different organs we have an exam-

* ‘American Cyclopedia of Practical Medicine.’ Art. ‘Absorption.’

ple of that loss of compensation between the exhalants and absorbents, which has been described as a cause of dropsy. The intelligent writer, to whom I have referred, considers it "extremely equivocal," whether dropsy is ever the result of a suspension of absorption alone, or simply from a loss in the equipoise of secretion or exhalation, and absorption. No facts, he thinks, justify the conclusion.* But the fact, that certain specific 'excitants' so modify nutrition as to occasion the taking up of hypertrophied parts, appears to us a sufficient reply to this. The exhalants are already too much excited, and yet a peculiar 'stimulant' gives occasion to the predominance of absorption,—of course by acting on a different set of vessels than the exhalants; for, if the excitant property were exerted upon them, the hypertrophy ought to augment, rather than diminish,—a circumstance, which, I think, sufficiently refutes the idea, that the exhalants fulfil the double function of depositing and breaking down, in nutrition; and confirms the almost universally received opinion, that the exhalants are endowed with the former office—the absorbents with the latter.

Connected with the subject of hypertrophy, Andral has the following judicious remarks, which tally with the views I have always entertained, and taught. "If from the simple observation of the phenomenon of hypertrophy, we pass to the study of its causes, what do we find? Do we consider that we have explained the formation of this state by a greater afflux of blood than common towards the part which is to be hypertrophied? This congestion of blood may doubtless be conceived to play some part in the production of the hypertrophy. But, theoretically speaking, it neither appears to me to be the sole nor even the necessary condition. It is not the sole condition; for the unusual appeal of blood towards an organ might take place in vain; it would but engorge it without changing its tissue, if there was not, in the organ itself, an augmentation of the ordinary assimilative force; in this last condition, if I may use the expression, the assimilative force elaborates more actively the materials which the blood carries to it, and in order that it may draw them in superabundant quantity into its nutritive whirlpool (*tourbillon nutritif*), it is necessary to suppose that more blood arrives at it in a given time. But is this excess of assimilative force itself necessary for the production of every hypertrophy, and may we not conceive cases, in which this force

* Loc. citat

remaining the same, there is a diminution of that other force, called disassimilating (*désassimilatrice*), by virtue of which the molecules of the solids are incessantly separated, to enter again into the mass of blood whence they had been drawn? Is it not owing to this, that more than one case of hypertrophy, ineffectually treated by emollients, and bloodletting, have disappeared under the influence of stimulating substances (iodine, mercury, &c. ?)" From these theoretical considerations, we arrive at the observation of facts, from which we may deduce the following conclusions. *First*. Hypertrophy is produced by the simple fact of an augmentation of habitual activity in the exercise of the functions of organs. *Secondly*. Other hypertrophies occur in consequence of active hyperæmia,—acute, but particularly chronic. In such case, we observe, that at times the hypertrophy exists only in the tissue, which has been irritated and in a state of hyperæmia; and, at others, after the return of the latter to its healthy state, the neighbouring tissues, which were slowly modified in their nutrition, remain diseased, and hypertrophied. This may be proved in many cases of phlegmasia of the internal and external tegumentary membranes. *Thirdly*. There are cases of hypertrophy in the production of which we can only, from analogy with the preceding cases, admit the existence of a stimulus—physiological, or pathological—in the organ in which it is situated. We say then, that there is nutritive irritation in such organ; but why might we not say as well, that there is diminution of activity in its regular action of decomposition? In both these opinions I see only hypothesis. If such be the case, let not the Therapeutics be supported exclusively on either of these opinions; but, taking the hypertrophy for fact, seek experimentally for the means of combating and destroying it. Thus iodine has been found a remedy for the hypertrophy of the thyroid gland; and mercury has been found capable of destroying certain exostoses, which are a true hypertrophy of the osseous tissue.

"Moreover, amongst those hypertrophies, whose cause has not been proved to be an antecedent or actual stimulation of the organ which is the seat of it, some consist of a purely local affection; some appear to be intimately connected to the general nutritive movement; they are only, so to say, one of the prominent expressions, which indicate or reveal the profound modifications, which the nutritive movement has undergone in every molecule of the body. Scrophulous individuals are in this category. Amongst the different groups of morbid phenomena presented by these individuals,—who has not remarked the simulta-

neous hypertrophy, which the thyroid gland, the brain, several parts of the osseous system, the liver, the tongue and the upper lip undergo in them? He would appear to us but little of a physiologist, who, in each of these modifications of nutrition, saw only a local affection, and restricted his endeavours to the removal of it.”*

From what has been said, the Therapeutical application of sorbefacients will be sufficiently intelligible. If we were possessed of remedies, which act specifically on particular parts of the absorbent system, all, that would be requisite, would be—to select them according to the precise topical affection. As yet, however, we know of scarcely an agent, which exhibits its special sorbefacient properties on any particular organ or tissue. Iodine is, perhaps, the only one. Its effects appear to be exerted on the glandular system more especially; and, of the glands and glandiform bodies, the *mammæ*—even in health—and the thyroid gland or body, when enlarged, are conspicuously affected by it.

Its agency in the latter affection—the disease of *bronchocele*—as it has been improperly termed—or *goître*, cannot indeed be contested. I have removed several cases by the administration of the tincture,—and have seen it at all times exhibit its power, unless the tumor had acquired a cartilaginous consistence. Whilst, however, its influence has been exerted on the morbid growth, it has exerted a sorbefacient influence on the mammary glands in the female, and, in some instances, has occasioned their total absorption,—an effect which is generally permanent.

The sorbefacient influence of the iodine has not been as marked in other glandular affections; although it has been exhibited in all varieties,—and hence it would seem to act upon glands and glandiform bodies rather than upon others, although some agency may perhaps be exhibited by it on all.

Where the object is, to promote the absorption of any accumulation of recrementitious fluid—as in the case of dropsical collections—the sorbefacients, we employ, affect the system generally, and, through it, the pathological condition, which gives occasion to the accumulation. Hence, in active dropsies, we find bloodletting doubly indicated. It reduces the erethism of the exhalants, and, by diminishing the quantity of circulatory fluid, adds materially to the absorbent energy; for, we have seen, in experiments on animals, fluid is observed to be taken up from

* *Précis d'anatomie pathologique. Tome premier, p. 184.*

the serous cavities of a living animal, as the blood is made to flow from a vessel.

Somewhat in the same manner, cathartics exert their beneficial agency, as well as diuretics. They detract from the fluid of circulation; but, in addition, like cathartics, they occasion a concentration of vital activity towards the organ on which their specific stimulation is exerted, and, in this way, give occasion to the imbibition of the exhaled humor.

The effect of mercury is to bring on a new action in the glandular and follicular systems, on which it acts as a specific excitant. In this way, it, also, becomes a sorbefacient, and it is one more frequently perhaps invoked than any other, if we except Iodine,—an article unknown in the first ten years of this century. It will, hence, be understood, that any local stimulant may be indirectly the cause of absorption, by modifying the nutrition of the body; but there are few agents, which act by stimulating specifically the absorbent system; they generally produce their effect, by occasioning a concentration of vital activity towards some other part of the system, and, under this operation, the absorption is rendered more active. Experience seems to show, that the administration of the alkalies is followed by sorbefacient effects, and Dr. G. Burrows, in his *Gulstonian lectures*, for 1834, attributes their effect in promoting absorption to their acting on the parts to be absorbed, as we have seen that they act on the the kidneys,* and out of the body,—namely, to their rendering the parts more soluble, and, consequently, more readily absorbed; but as acids—as the acetic and the tartaric—are likewise sorbefacient, it is probable, that both one and the other affect the whole system of nutrition, so as to interfere with the vital affinities, and to allow the blood to pass through the intermediate circulation unmodified.

The influence of the nervous system, as a sorbefacient, is strongly exemplified, when powerful impressions are made upon it, without any evacuation. Hence, as in many of the other classes of remedial agents, we may admit of what may be termed ‘mental’ sorbefacients. Of these we have examples in the effect of the imagination in discussing tumors of various kinds. Some of these growths are possessed of but little vitality; and, if the nervous and vascular influence be detracted from them, they speedily die. This is the way in which charms remove warts. It is a common popular superstition, that if we steal a piece of

* See page 306.

beef, rub warts with it, then bury the beef, or throw it over the left shoulder without looking behind us,—as the beef rots, the warts will decay;—and that a dead man's hand, rubbed nine times on a wen, or an enlarged gland, will dispel it; and such is the occasional result: in the same manner, Perkinism, touching for the King's evil, &c. &c., become sorbefacient agencies. The influence of the 'royal touch,' in healing different sores, and other manifestations of scrophula, are described by Shakespeare, in his tragedy of 'Macbeth.'

"Mal. Comes the king forth, I pray you?

"Doct. Ay, sir. There are a crew of wretched souls
That stay his cure; their malady convinces
The great assay of art. But at his touch,
Such sanctity hath Heaven given his hand,
They presently amend.

"Mal. I thank you, Doctor.

"Macd. What's the disease he means?

"Mal. 'Tis called the evil,
A most miraculous work in this good king,
Which often since my here-remain in England
I've seen him do. How he solicits heaven,
Himself best knows; but strangely visited people,
All swoln and ulcerous, pitiful to the eye,
The mere despair of surgery, he cures;
Hanging a golden stamp about their necks;
Put on with holy prayers; and 'tis spoken,
To the succeeding royalty he leaves
The healing benediction."

It appears, consequently, that any thing—of a physical or moral character—which concentrates the vital activity on any part of the organism, may diminish the amount of exhalation in another part, and at the same time modify, perhaps, the function of absorption; and, that under this modified nutrition, parts may be reduced in bulk; and morbid tumors disappear, as well as dropsical accumulations in different serous and cellular cavities.

It is a general rule, applicable, perhaps, to every organ in the body, that its nutrition becomes augmented under appropriate exercise, and that inaction is attended with more or less atrophy. This is strikingly manifested in the muscles of the arm of the prize fighter and fencer, which, in comparison with those of mankind in general, appear to be in a state of hypertrophy. There are, however, certain secretions, which are more plentifully effected during inaction, and the absence of all stimulation,—the secretion of fat, for instance: accordingly, if we are desirous of fattening animals, or of inducing artificial obesity, we keep them at rest, and in total obscurity, in order, that they may not even experience the slight stimulation of light, in augmenting the cutaneous or other secretions. In like manner, castration

and spaying dispose to obesity, by removing those excitations, which the venereal passion engenders, and, hence, the proverbial fatness of the eunuch, both in man and animals. These two cases of nutritive exhalation are constantly opposed to each other. Exercise develops the muscular fibre, whilst the want of it augments the exhalation of the fluid, which is deposited between the muscular fibres and fasciculi; and which gives the rotundity we so much admire in the delicate muscles of the female. In the one case, we have hypertrophy of the organ exercised; in the other, hypertrophy of the adipous exhalation.

What happens to the muscles occurs equally to other organs. Even the great organ of the intellect,—that through which the immaterial principles within us acts,—doubtless has its nutrition modified by intellectual labor or idleness, but whether to such an extent as to impress the skull, so as to be manifested without—as the phrenologists would maintain—is a matter of much question and doubt.

It follows, then, from these remarks, that if we are desirous of rendering the nutrition of an organ more active, we must take measures for keeping it in appropriate action; and that, on the other hand, if we desire to diminish the nutritive exhalations, whose office is subsidiary to the organs, we must inculcate the due employment of corporeal exercise, with the view of augmenting the depuration by the cutaneous and pulmonary transpirations.

A sorbefacient influence—invoked by the surgeon especially—is ‘pressure.’ If a fractured arm be kept firmly bound by splints and bandages, for the ordinary period of a few weeks, the arm is found to be much extenuated when the splints are removed, in consequence of the modification of nutrition induced by the pressure. A knowledge of this and similar facts has led the surgeon to employ pressure in cases of tumors and morbid growths where the application is at all feasible, and, in this way, large tumors have been made to disappear. A Mr. Young, of London, acquired much celebrity, in cases of scirrhus and cancer, by this mode of medication, and although, in such cases, it will unfortunately too often fail, good effects were certainly produced by it in the hands of Mr. Young, as they have occasionally been in the practice of others. It is, however, in the less malignant kinds of morbid growths, that the remedy is most effectual,—more so, indeed, than perhaps any other plan of treatment.

But it is not alone in cases of hypertrophies, of the kind referred

to, that pressure has been invoked. It has been found extremely useful in dropsical infiltrations into the cellular membrane of the lower extremities, as well as in ascites, and dropsical affections of the other splanchnic cavities.* In enlargements of the ovaries, and other tumors within the abdomen, methodical compression has likewise been found of essential benefit. I have, at this time, under my charge, a lady, both of whose ovaries are much enlarged, and to whom an appropriate bandage around the abdomen has been of great service. Not only does it support the parietes of the abdomen and the contained parts, in sudden shocks, but it appears even to have lessened the hypertrophy.

‘Friction’ is another remedy, belonging to the division we are considering, and it is one had recourse to by the surgeon with signal benefit. After violent sprains, in which much fluid has been effused into the cellular membrane, there is no mode of medication, which occasions the absorption of the effused fluid so rapidly as rubbing the part with the hand, simply dipped in flour, or covered with some liniment. The object of dipping the hand in flour is to prevent the abrasion, which would necessarily result from the friction; and, in the generality of cases, liniments are of no other service. This, at least, applies to the simple oleaginous liniments; but, where exciting substances are added, some sorbefacient influence may be exerted by them. To produce the full sorbefacient effect, in the cases I have mentioned, the friction must be continued for a long time,—for at least half an hour;—and it must be repeated as the case may require. In Scotland, there are old women, who obtain a livelihood by this kind of ‘dry rubbing,’ and whose celebrity is such, that I have known a respectable patient go from a border county of England to Edinburgh to be operated on by them.

From all that has been said, it is clear, that we have, in the class of sorbefacients, a number of valuable remedial agents, that may be adapted to various states of disease, which may have resisted other modes of management.

* ‘Clinique médicale de l’Hopital Necker,’ par. J. Bricheteau. Paris, 1835, p. 247.

TABLE

OF THE CHIEF SORBEFACIENTS, AND THEIR OFFICINAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Acida vegetabilia [?] <i>Vegetable acids.</i>			
Alkalia [?]. <i>Alkalies</i> (See Table of Antacids.)			
Ammoniacum. } <i>Ammoniac.</i> }	{ See Table of Expectorants.	Emplastrum Ammoniaci. <i>Ammoniac Plaster.</i> (Ammoniac. oz. 5; Aceti lb. $\frac{1}{4}$. Boil to a proper consistence.) Emplastrum Ammoniaci cum Hydrargyro. <i>Plaster of Ammoniac with Mercury.</i> (Ammoniac purif. lb. 1; hydrargyri purif. oz. 3; ol. sulphur. f. dr. 1.—Rub the mercury and oil until the globules disappear; add the melted ammoniac.)	
Brominum. } <i>Bromine.</i> }	{ From Bittern. It exists in various salines; and in mineral waters.	{ In solution (Bromin. p. 1; aq. distillat. p. 40.) Also, in the form of <i>Hydrobromate of Potassa.</i> <i>Externally.</i> (Potass. hydrobrom. dr. 1; adipis, oz. 1.)	{ m 6. } gr. 1.
Galbanum. } <i>Galbanum.</i> }	{ See Table of Antispasmodics.	{ Emplastrum galbani compositum. <i>Compound Galbanum Plaster.</i> (Galban. oz. 8; emp. plumbi. lb. 3. terebinth. dr. 10; picis burgund. pulv. oz. 3.)	
Hydrargyri Præparata. <i>Preparations of Mercury.</i>	{ See Table of Excitants.	The different forms given under the head of Excitants. Emplastrum Hydrargyri. <i>Mercurial Plaster.</i> (Hydrarg. oz. 6; ol. oliv.; resin. ana oz. 2; empl. plumb. lb. 1.) Linimentum Hydrargyri. <i>Mercurial Liniment.</i> (Ung. hydrarg. adipis ana oz. 4; camphor oz. 1; sp. rectific. m 15; aq. ammon. f. oz. 4.)	{ See Table of Excitants.
Iodinum. <i>Iodine.</i> (Contained in <i>Fuci</i> . sponge; in sea-water, certain salt springs, &c.)	{ From the mother waters of <i>Kelp</i> , by adding sulphuric acid, and applying heat. The iodine is driven over.	.....	gr. 1 to 3.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
		Tinctura Iodini. <i>Tincture of Iodine.</i> (Iodin. oz. $\frac{1}{4}$; alcohol. lb. $\frac{1}{4}$.) }	m 10 to 20.
		Unguentum Iodini. <i>Ointment of Iodine.</i> (Iodin. scr. 1.; adip. oz. 1.)	
		Iodidum Potassii. Iodide of Potassium.—(In solution, <i>Hydriodate of Potassa.</i>)	gr. 1 to 3.
		Liquor Potassæ Hydriodatis. <i>Solution of Hydriodate of Potassa.</i> (Potass. Iodid. dr. $\frac{1}{4}$; aquæ distillat. f. oz. 1.)	} m 10 to 15.
		Unguentum Potassæ Hydriodatis. <i>Ointment of Hydriodate of Potassa.</i> (Potassæ iodid. dr. $\frac{1}{4}$; adipis oz. $1\frac{1}{2}$.)	
		Iodidum Ferri. Iodide of Iron.—(In solution, } <i>Hydriodate of Iron.</i>)	{ gr. 2 to 10. in solution.
		Potassæ Hydriodas Iodureta. <i>Ioduretted Hydriodate of Potassa.</i> (Potassæ Iodid. p. 20; iodin. part. 6.)	} gr. 1 to 3.
		Solutio Hydriodatis Potassæ Iodure- tæ. <i>Solution of the ioduretted hydriodate</i> <i>of potassa.</i> —(Coindet's.) (Potass. iodid. gr. 36; aq. distill. oz. 1. adde iodin. gr. 10.)	} m 10 to 46.
		Unguentum Hydriodatis Potassæ Io- duretæ. <i>Ointment of ioduretted Hydriodate of</i> <i>Potassa.</i> (Hydriodat. potass. ioduret. dr. $\frac{1}{4}$; iodin. gr. 10 to 15; adipis oz. $1\frac{1}{2}$.)	
		Hydrargyri Ioduretum.—(Proto-et Deuto.)—(The former is the pre- cipitate, on mixing a solution of ni- trate of protoxide of mercury with a solution of hydriodate of potassa; —the latter is the precipitate, on mixing a solution of the deuto-chlo- ride of mercury, with a solution of the hydriodate of potassa.)	} gr. $\frac{1}{4}$ to gr. 1.
Liquor Calcis muria- tis. <i>Solution of Muriate of</i> <i>Lime.</i>	By dissolving 9 oz. of white marble (carbonate of lime.) in 16 oz. of muriatic acid, diluted with water; evaporating the solution to dry- ness; dissolving the residuum in its own weight and a half of distilled water, and filtering the solution.	.....	m 30 to f. dr. 1.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
<p>Spongia usta. Burnt Sponge. (Contains iodine.)</p>	<p>By cutting sponge into pieces; heating it to remove extraneous matters; burning it in a close iron vessel until it is black and friable, and rubbing it to a fine powder.</p>	<p>.....</p>	<p>dr. 1 to dr. 3.</p>
<p>Compression. (Methodical;—by means of adhesive plaster, or bandages, according to the case.)</p>		<p>Emplastrum Plumbi. <i>Diachylon Plaster.</i> (Plumb. oxid. semi-vitrei lb. 5; ol. oliv. cong.; aq. lb. 2. Boil and form a plaster.)</p> <p>Emplastrum Resinæ. <i>Adhesive Plaster.</i> (Resin. lb. $\frac{1}{2}$; emp. plumb. lb. 3. melt.)</p> <p>Emplastrum Saponis. (Sapon. dur. lb. $\frac{1}{2}$; emp. plumb. lb. 3. Melt, and boil to a proper consistence.)</p>	
<p>Friction. (By means of the hand, dipped in wheaten flour; or in one of the liniments, &c.)</p>		<p>Linimentum Camphoræ. (Camphor. oz. $\frac{1}{2}$; ol. oliv. f. oz. 2.)</p> <p>Linimentum Camphoræ compositum. (Campbor. oz. 2; aq. ammon. f. oz. 6; sp. lavand. O j.)</p> <p>Linimentum Hydrargyri. (See above.)</p> <p>Linimentum Saponis camphoratum. (Sapon. oz. 3; camphor. oz. 1; ol. Rosmarin; ol. organ. ana f. dr. 1; alcohol. O j.)</p>	
<p>Mental Sorbefacients. (Imagination—Emotions.)</p>			

SECTION XIV.

REVELLENTS.*

Definition of Revellents—Epispastics—Definition of epispastics—Rube-faciens—Vesicants—Suppurants—Actual and potential cauterants—Modus operandi—Permanent and intermittent revulsions—Intensity of the revulsion—Blisters, as revellents in fever—Revulsion in the changeable phlegmasiæ—Choice of situation for the revulsion—Therapeutical application of revellents—In fevers—In the phlegmasiæ—In hemorrhage—In mental alienation, hysteria, tetanus, &c.

REVELLENTS are agents, which, by producing a modified action in some organ or texture, derive from the morbid condition of some other organ or texture.

The effect, thus induced, is termed 'revulsion,' 'antispasmodic' or 'derivation,' and it is said, by Conradi,† to be exerted, "when a topical congestion, or stimulation, or other affection of a part leaves that part, and is drawn towards another, and usually less important part."

I have more than once referred to the value of this agency in the treatment of disease, and have remarked, that much of the good effects produced by local stimulants, of every kind, is ascribable to this principle of action. It is on this account, that the class of revellents is introduced here,—that is, under the great division of excitants, as the effect of almost every variety is ascribable to the exaltation of vital manifestation, they produce in the parts, with which they are made to come in contact. "Next to direct debilitation," says a modern therapeutical writer, "there is no medicinal agency more certain, and that ought to be more frequently resorted to, than revulsion. It is induced by stimulating substances, which elevate the organic actions in

* Antispasmodics, Derivatives, Counterirritants, Revulsives,—from *revellere*, 'to pluck out.'

† *Handbuch der allgemeinen Therapie.* s. 91.

the parts to which they are applied, or towards which their action is directed, and that are more or less remote from the inflamed organs. The remedies, employed in this medication, have been called, by some, 'indirect debilitants;' but such a denomination is inexact, for all revulsives exert a stimulating impression; and if their object be—to allay irritations existing at a distance—their inopportune use, or their too great activity is followed, in many cases, by contrary results:"*—and he adds in a subsequent page (738.) "The phenomenon of revulsions has hitherto been viewed in too limited a manner. Physicians have not properly attended to the fact, that every medicinal operation, by means of which the vital actions are excited in others than the parts affected, also belongs to that class. It would seem, that the rubefacient, suppurative, or escharotic, cutaneous revulsives have alone occupied the attention of practitioners, and that frictions, baths, cataplasms,—in a word, every agent, calculated to solicit the organic activity, concentrated internally to the external parts of the body,—are not esteemed revulsives; and reciprocally, the effects of a multitude of stimulants on the digestive organs, heaped in during the most serious acute diseases, and whose impression is not always mortal, are inexplicable to a great number of physicians, because they do not recognize in them the revulsive effect, which such agents occasionally produce. This medication, when properly investigated, ought to become the object of more extensive and useful considerations in practice, until the whole extent of its influence, and the astonishing variety of which it is susceptible in its applications, shall be better understood."

Under the history of the separate divisions of remedial agents, already considered, I have adverted to their revulsive operation, and we have seen, that all local stimulants are possessed of more or less of it. It will, therefore, be only necessary, under this head, to make some general observations on their application in disease, and to regard especially those agents, which are usually looked upon as possessing counterirritating properties *par excellence*, or, in other words, such as are generally classed, by therapeutical writers, under the head of epispastics, and I may add of escharotics,—whenever, that is, the latter are employed to do more than act chemically on the parts with which they come

* Bégín, Op. citat. p. 734.

in contact, and to affect organs or tissues, that are at a greater or less distance from the seat of their impression.

'EPISPASTICS' are agents, that occasion inflammation, vesication, suppuration, or sloughing when applied to the cutaneous surface. Dr. A. T. Thomson has subdivided them into 'rubefacients,' 'vesicants,' 'suppurants,' and 'actual cauterants.' To these, his division of *escharotics* may be appropriately added, for although the articles, belonging to the division, are generally employed for mere local agencies on the part with which they are placed in contact; they, like the rest of the class of epispastics, are often used for acting revulsively on other parts of the system.

'Rubefacients'—as the name imports—are substances that redden the surface, by exciting the action of the capillaries, and giving occasion to an afflux of vascular and nervous power to the part on which they are applied; hence pain is a usual consequence of their employment. The most common rubefacient, in acute affections more especially, is the sinapism or mustard cataplasm; but every stimulating application—every liniment, of which capsicum, turpentine, ammonia, &c., form the basis—is rubefacient. The same may be said of friction with the dry hand, and of the application of heat. Every thing, in short, which, by irritating the cutaneous surface, attracts the nervous and vascular influxes to the irritated part, and reddens it, is a rubefacient.

If the rubefacient be sufficiently powerful, it may, besides inducing redness, be followed by an effusion of serum beneath the cuticle of the part, so as to form a blister. The rubefacient then becomes a 'vesicant.'

The first effect of the ordinary vesicants is to produce rubefaction, and it may be arrested at this point, if the practitioner be desirous that it should not extend farther. It may be laid down as a general rule, that blisters do not act by the discharge they excite: their depleting effect, in this way, can obviously be but trifling, unless in very debilitated states of the system,—while the loss of fluid, thus incurred, may be disadvantageous. It is the counterirritation, which is the great sanative principle, and this can be obtained without vesication, although the production of the latter condition may be an evidence, that the former has been carried to the necessary extent. In the case of many of the vesicants, too, it is difficult to obtain the necessary extent of counterir-

ritation, without vesication resulting at the same time, and therefore the practitioner rarely attempts to arrest their action at simple rubefaction.

Of the various agents, used for exciting vesication, cantharides are the chief; but where it is desired to excite sudden vesication, the application of boiling water, or of the red hot iron, is, at times, had recourse to. Vesication or counterirritation, thus induced, is rarely, however, as efficacious, in changing the morbid condition, as where it is more gradually induced. Hence, time has been regarded as a useful element in the action of revulsives.*

The inflammation of the skin, caused by vesicants, is occasionally attended with fatal consequences. It is of the erysipelatous kind, and, under particular circumstances—as regards age, condition of the system &c.—the inflammation eventuates in gangrene and death. In very young children, great irritation is apt to be induced by blisters, and, if the child be laboring under any morbid condition of the dermoid tissue,—such, for example, as is present in measles or scarlatina, the inflammation may terminate unhappily. To obviate this, when vesicants are esteemed necessary in the diseases of infants, they should not be permitted to remain too long on the part. From four to six hours will be sufficient, and a piece of fine gauze or of tissue paper may be placed between the blistering plaster and the skin—if cantharides be used—in order, that no particle of the flies may adhere to the vesicated surface. We can hardly imagine an occurrence more disagreeable to the philanthropist than that of a patient dying, in consequence of the application of an agent from which he expects a cure, or at least a mitigation of the symptoms; great caution is therefore necessary in the use of these agents, in very early life, especially in the diseases referred to. I have known three or four cases of death manifestly accruing from the use of blisters under such circumstances, although it is probable, that in most of the cases a fatal event might have ultimately resulted, from the disorganization, produced by the mischief for which the blister was recommended.

There is another great inconvenience, attendant upon the employment of vesicants composed of cantharides. This is—the absorption of the cantharidine, which enters the circulation, and proceeds to the urinary organs, giving rise to strangury, and, at times, to intense vesical irritation. That this is the mode in which the effect is produced,—that is, by entering the circulation,—is demonstrated by the fact, that the intervention of tissue

*Begin, Op. cit. 739.

paper, or of gauze, although it may not prevent vesication, effectually obviates the strangury;—the tissue paper preventing the absorption of the cantharides, which would otherwise have been effected. Yet, some have referred the strangury, in such case, to sympathy. Were this explanation correct, the tissue paper or gauze ought not to prevent it, as the vesication is accomplished through them. At times, it becomes necessary to apply the blistering plaster over a surface, which has been scarified in the operation of cupping. The only precaution, here again, requisite, is to cover the wounds, made by the scarificator, with tissue paper.

‘Suppurants’ produce a deeper degree of inflammation than the epispastics I have mentioned. Their effect extends to the cellular membrane; involving, therefore, the whole of the common integuments. Issues and setons belong to this class, as well as the pustulation, induced by the ointment of tartarized antimony, rubbed upon a part—a remedy which has been much employed of late years. It is a somewhat singular circumstance, that when this ointment is rubbed upon the skin, instead of producing simple inflammation of the skin, of a diffusive or erysipelatous character, it should excite inflammatory irritation, more especially in the cellular membrane beneath, and that this irritation should exhibit itself in the form of a crop of pustules, not very much unlike those of variola.

In this country, issues and setons are still greatly used, but they are by no means as much so in Europe as they were formerly. They are uncleanly, by means of the discharge which they excite, and great attention to them is necessary; whilst it is extremely doubtful, whether any of the benefit, derived from them, is ascribable to the discharge, which accompanies them. I but rarely have recourse to them on these accounts, preferring repeated blisters, and a succession of revulsions, to their more permanent irritation: to this latter, the system soon accommodates itself, so that, after an issue or seton has been long established, it becomes, as it were, a part of the healthy condition, and cannot even be healed without danger of evil consequences. At one time, it was the universal belief—much encouraged by the arguments of Mr. Pott—that the discharge is an important adjuvant to the counterirritation, caused by issues or setons, but, since his time, the belief has gradually faded, and there are many surgeons—amongst whom must be mentioned the veteran Larrey—who think it better to produce counterirritation, where practicable, without any dis-

charge ; and hence, when they use the moxa, they endeavour to restrict its effects to the rubefaction it occasions. Still, there are cases—as in spinal disease—where it is easier to insert a seton, or to establish an issue, than to apply a succession of other counterirritants ; and, consequently, issues and setons are no where banished from practice, although they are more sparingly used by the most distinguished practitioners in many countries.

In the perpetual blister—as it is called—we have an example of a suppurant agency. Some irritating salve is applied to the surface excoriated by the blister, which excites suppurative inflammation, and this may be kept up, as in the ordinary issue, of which the perpetual blister is of course a variety,—but it is liable to the same objections as the issue, and may be advantageously replaced by repeated blisters, which establish a succession of centres of fluxion or of revulsion, so that the system never becomes habituated to them ; and more influence is, therefore, exerted upon the morbid condition, for the removal of which they may have been adopted.

It is to substances, that are capable of producing an eschar or slough, that the term ‘ escharotics ’ has been given. They are, consequently, most commonly had recourse to for the formation of issues,—the caustic potassa, for example, being applied to the skin, so as to chemically disorganize it, or destroy its vitality, after which a new action is set up in the vessels beneath the slough, so as to cause it to be thrown off ; after this, the excavation is kept open by inserting some irritant—as an issue pea—which maintains a copious secretion of pus from the ulcerated surface. In the ordinary division of escharotics—as adopted in the books—we have a separation made into those, that operate more powerfully, destroying the life of the part under all circumstances, and which are arranged under the head of ‘ cauterants,’ and those that act with less energy, and are chiefly employed to destroy diseased and fungous growths, and which are arranged under the head of ‘ erodents.’

Cauterants may be either ‘ actual ’ or ‘ potential ’ ; that is, they may either produce their effect by the agency of caloric, or by virtue of chemical powers, which are capable of destroying, or disorganizing, the living solid.

The effect of the actual cauterant differs according to the form in which the caloric is applied ;—whether by means of heated metal, the moxa, heated vapor, or water, or other fluid. It differs, also, when the metal is used, according to the degree of

heat ;—at the white heat producing immediate disorganization of the parts with which it comes in contact ; at the red heat, producing rather a state which may often admit of the parts being restored, without much, if any, loss of substance. The less degree of heat is, therefore, attended with more pain and inflammation, because the vitality of the part is not extinguished, as where the iron is applied at the white heat.

Whenever actual cauterants are employed as counterirritants, the excitement they produce is rapidly effected ;—at once, by the application of heated metal or water,—more gradually by the moxa ; but still, even in the latter case, almost instantaneously, compared with the action of many of the class of potential cauterants, which require a long time before the eschar is formed. This is the case with the caustic potassa—the potential cauterant most frequently employed. It is not until after the lapse of several days, that the eschar, made by rubbing the potassa over the skin, separates, or gives unequivocal evidence of disorganization.

As the effects of the actual cauterants are rapid and severe,—accompanied with intense pain, heat and redness,—they are adapted for cases, in which it is necessary to make, at once, a powerful impression upon the nervous system, and in which a sudden revulsion, thus induced, appears to be indicated. Accordingly, the use of the moxa has occasioned a salutary abstraction of the nervous influence ; and many deep-seated pains have yielded to it, which had resisted the action of the ordinary counterirritants, though repeatedly applied. In long continued neuralgic pains—whether seated in the cerebro-spinal centres, or in the nerves emanating from them—the morbid catenation is often suddenly and effectually broken in upon by these severe and rapid revulsions.

Of the value of the moxa, as a therapeutical agent, in these and similar cases, we have numerous examples, on the authority of Larrey, and many other practitioners of France and the continent of Europe more especially. The remedy was introduced to the notice of British practitioners by myself, in the first English monograph on the subject,* and, since then, it has been treated on by Wallace, Boyle, and others.

All the forms, then, of epispastics are indebted, for their efficacy as remedial agents, mainly to the counterirritation or revul-

* 'On the use of the moxa, as a therapeutical agent ; from the French of Larrey, with notes, and an introduction, containing the history of the substance,' by Robley Dunglison, etc., etc. London, 1822.

sion which they effect, and the choice of such as are adapted to particular circumstances of disease must greatly depend upon convenience, &c. of application, which certain articles of the class may possess more than others; and as there are generally fewer objections to vesicants and rubefacients than to the others, they are more frequently employed, whenever the revulsion, which epispastics in general are capable of effecting, becomes necessary or expedient.

In the employment of revulsives in general, it is an interesting inquiry to determine the extent of surface, which it is desirable to affect by their direct application. This is a difficult matter to decide. It is obvious, however, that if we have the vital manifestations modified over a very limited compass, but little beneficial agency may be exerted on the morbid catenation, which it is designed to break up: whilst, on the other hand, if a very large surface be irritated, the disease may be aggravated by the irritative irradiations proceeding from it. Moreover, it is probable, that if a very extensive surface were inflamed in this manner, the same disastrous consequences might ensue, as in cases of extensive burns. In these, it has been considered, that death will almost surely occur, if they implicate one-eighth part of the cutaneous surface. Bégin* affirms, that the extent of the surfaces, receiving the impression destined to become revulsive, exerts great influence on the effects of this sort of medication. Thus, the same pediluvium, which, when applied to the feet, proves inefficacious, will often produce the desired effect if the whole leg be immersed; and he adds, that an extensive, though moderate rubefaction may produce greater effects than a violent inflammation limited to a small portion of integuments. This is true, however, only within certain limits. In many affections, as I have remarked, in reference to the moxa especially, a violent degree of irritation, excited in a very trifling extent of surface, will effect what other varieties of epispastics, although repeatedly employed, have totally failed to accomplish. Custom has established a magnitude for the ordinary blister, as well as for the extent of surface to be implicated in the formation of an issue, and although it is possible and probable, that their magnitude might often be varied with advantage, it is a point, as I have already observed, on which it is extremely difficult to decide.

A similar remark applies to the length of time, during which the counterirritation should be maintained, in order to produce

† Op. cit. p. 738.

the greatest amount of benefit. Whether, for example, a mere momentary irritation, however violent, can occasion as salutary results as one that is more prolonged; and, again, whether a permanent or an intermittent revulsion is, as a general rule, more effective for the removal of disease, especially of diseased actions of some continuance. In the case of the moxa, the revulsion is but temporary, yet, we have seen, it has been often useful, short as may have been the duration of the irritation produced by it. The moxa is not, however, in general, as well adapted for the removal of inflammatory and many other conditions, as the revulsion, which can be effected by vesicants, and by certain of the rubefaciants. It is chiefly, when the diseased action has been prolonged for a considerable period, and in affections, which belong to the neuralgic class, that sudden and violent revulsions are productive of the most marked advantage. When the disease is of an acute character—as the different phlegmasiæ—revulsives, which implicate a greater extent of surface, and are more prolonged in their action, are decidedly preferable.

With regard to the question—whether a permanent or an intermittent revulsion is more efficacious?—I do not think, that much dissidence now exists amongst Therapeutists. The majority are unequivocally in favor of the latter plan, although circumstances may often induce them *practically* to have recourse to the former. The reasons, in favor of this preference, are cogent. When an artificial irritation, accompanied, or not, with increased secretion from the part, has been established for some time, it ceases, in a great measure, to be a morbid condition, and becomes, as it were, a part of the healthy function, so that it cannot be arrested, without inconvenience being apt to result, and without danger of a centre of fluxion being established in some internal organ, more disposed than others to assume the morbid condition. In this way, many discharges, the result of morbid action, become, in process of time, healthy, and cannot be officiously interfered with. On the other hand, if a succession of irritations be produced, the system never becomes habituated to them, and the repetition of the irritation, after the lapse of a short period, occasions the same beneficial impression, as on its first employment. Hence it is, that a succession of vesicants, and, indeed, of every variety of epispastic, is to be preferred to a more permanent application—and that issues and setons lose much of their beneficial influence in the latter periods of their employment;—their good effects, as revulsives, being in

an inverse ratio with the shortness of the period, during which they have been in action.

The intensity of the artificial irritation, induced by a revulsive, is worthy of consideration, in a therapeutical point of view. If it be but trifling, it may be insufficient to break in upon the internal morbid catenation; and, on the other hand, if too violent, irritative irradiations may pass in various directions, and may even add to the internal mischief. Every practitioner must have occasionally witnessed an aggravation of symptoms from this cause, especially in those whose nerves are unusually impressible. In such, no variety of epispastic can, at times, be used. I have, at this time, under my care, a lady, who is thrown into the most violent nervous agitation, by the application of the smallest blister; and blisters have occasionally been known to induce convulsions. There are certain individuals, too, who suffer excessively from the vesication induced by cantharides, and yet, who are not—what would be called—extremely nervous. Their cutaneous nerves are, however, inordinately impressible. In such persons, vesicants would necessarily fail in their effects—by the general disorder, which would follow the high degree of erethism of the dermoid structure. In such individuals, blisters are never found to exert their ordinary salutiferous agency; on the contrary, the irritation, they produce, is reflected to every part of the economy, and too often the diseased action, for the removal of which they were applied, is, in this way, augmented. In like manner, where the powers of the system have been greatly reduced, and much nervous irritability has been developed, blisters are apt to produce mischief. Broussais has made this fact the foundation of one of his propositions,—restricting it, however to cases of gastro-enteritis. “Vesicatories,” he says, “often augment gastro-enteritis, because the inflammation, which they produce, adds to that of the digestive mucous membrane, instead of producing revulsion; they do not, then, render the services expected from them, in that grade of these diseases, which is called ‘adynamic fever.’”*

The character, and period of the disease have much to do with the action of revellents. Every practitioner must have observed, that in the phlegmasiæ, when the disordered actions run inordinately high, but little effect is usually produced by revellents.

* Prop. 238.

I am not, however, prepared to say, that they invariably do harm. I had an opportunity of witnessing, for a long time, the practice of an individual, much engaged with the duties of his profession, who always had recourse to blisters, from the first onset of inflammatory affections, often not only with impunity, but with manifest advantage. Theoretically, it would seem, that if the manifestations are already largely exalted, any source of irritation ought to add to such exaltation; the principle, however, that two irritations do not easily exist, at the same time, in the body, to the like intensity, applies even here; and, I can say, from extensive observation, that although the beneficial agency of revellents is not as marked as where remedies have been premised to allay the tumult in some measure, they have not always appeared to me to aggravate the disease, and have often been followed by a mitigation of the morbid action. I cannot, therefore, subscribe to the opinion, that "in very strong subjects affected with intense irritations, accompanied with considerable febrile excitement, and having their seat in viscera important to life, or propagated to large surfaces, revulsion is next to impossible, and cannot even be attempted without danger."* The danger does not appear to me to rest so much on the employment of the revulsives, as on the neglect of more effective measures, which such cases imperiously demand.

Broussais has maintained, that revulsive irritations must always be stronger than those they are intended to replace, otherwise they turn to the benefit of the latter; but this appears to be a mere *gratis dictum*, and it has, accordingly, been dissented from by many of his followers. Upon the principle of action, which we have endeavored to lay down, it would seem, that good must always be derived from a revulsive irritation in appropriate cases, even should such irritation fall somewhat short of the precise degree, necessary for completely putting an end to the morbid action, for the removal of which it was adopted. I cannot see how the morbid action must necessarily be augmented by it. "Theory, like practice," says the author whom I have just quoted, "shews, that when an irritation is brought to that degree of moderation which permits the employment of revulsives, it is generally diminished by the influence of remote stimulations, even where these are too inconsiderable to cause its total disappearance. In this manner ophthalmia is daily cured, partly by irritating frictions behind the ears: a blister to the arm relieves

* Begin, Op. citat. p. 747.

chronic pulmonary catarrhs, even in those in whom it is insufficient to produce a complete revulsion ; and urethritis, colitis, &c., are partially alleviated by various revulsives, which are too feeble to cure them.”*

There was a time, when blisters were much employed at a particular period of adynamic fevers,—in those very cases, indeed, in which, according to Broussais, they do not render the services expected of them. The practice has gone out of vogue in Europe, but it is followed in this country. It consists in applying blisters to the arms and legs, in protracted fever, when the powers of life have become so far reduced, that stimulations appear to be clearly indicated. I have before remarked, that epispastics are not advisable stimulants in fever, but as revulsives they may be had recourse to, occasionally, with marked advantage. When, for example, the disordered actions, constituting fever, have gone on for weeks, without the existence of any considerable local mischief, the revulsive irritation, induced by epispastics, becomes a centre of fluxion, so that the mischief is, as it were, localized, and the morbid chain broken in upon. Accordingly, in this way, epispastics may be used most advantageously in febrile complaints ; but care must be taken, that the irritation, induced by them, is not too intense, so as to be reflected to every part of the system, and thus add to, rather than detract from, the disorder of functions.

In like manner, in chronic irritations of different organs and tissues, epispastics frequently break in upon the habitual derangement of action, and succeed in inducing a salutary revulsion, after every other medication has failed.

It would be a matter of moment, if we were enabled to point out the parts of the system, which sympathize with each other, in such sort, that if revulsives were applied to the one, they would certainly detract from the morbid actions going on in the other ; but this is a difficult subject of investigation, and we are not sufficiently masters of the physiology of the animal economy to pronounce, with much satisfaction, on the subject. Often, too, we find, that although sympathetic movements may be established between different organs, they are by no means of the antithetic or revulsive kind, and hence the rule—difficult of execution—has been laid down, that artificial irritants should be made to operate upon such parts as perform functions contrary to those

* Begin, *Op. cit.* 741.

of the irritated organ, and always at a distance from those that may sympathize with that organ.* In elucidation of this, it has been remarked, that the skin may be irritated with advantage in pulmonary catarrhs, owing to the balance of action existing between it and the mucous coat of the bronchi; but this does not apply to gastritis, as its overexcitations are too readily communicated to the stomach. These rules are, however, too exclusive; and every Therapeutist must have discovered their inaccuracy, in the good effects, which he has found to be produced by revulsives, where the lining membrane of the stomach has been more or less inflamed. The severe vomiting, which accompanies such affections, often resists every other remedy, and is ultimately arrested by epispastics.

Broussais exhibits more caution than is usual with him, when he speaks of the use of epispastics in diseases of this kind. "Vesicatories," he remarks, "*often* augment gastro-enteritis, because the inflammation which they produce, adds to that of the digestive mucous membrane," &c. (Prop. cclxxxviii); and, in his next proposition, he says, "vesicatories most frequently exasperate inflammations, whether acute or chronic, of the different tissues of the lungs, when they are applied before the employment of antiphlogistics; but, after repeated bleedings, they are very successful in producing revulsion." In these propositions, the author has manifestly reference rather to the modifying effects of the high degree of inflammatory irritation existing in the system, than to any essential and universal difference between the sympathies of the gastric and pulmonary organs, and those of the skin. The true explanation of the action of revulsives appears to be that which we have laid down;—that two irritations do not readily exist, at the same time, in the system; so that, if under proper conditions, during the existence of any morbid irritation in some internal organ, an artificial irritation be excited at a due distance from it, the morbid process will subside in the internal organ, and the vital energies be concentrated towards the part artificially irritated. Farther than this we cannot go with much satisfaction, and, if we attempt to designate the parts, which perform functions opposite to those of the irritated organ, in order that we may apply our revulsives to them, we are likely to be led to the most erroneous conclusions. On the deeply interesting subject of the sympathies of organs, we are but little instructed. We observe the physiological relations between the

* Richond, 'Exposition des principes de la nouvelle doctrine médicale,' p. 220.

stomach and the uterus, in the changes induced by pregnancy; and the intimate consent between the latter organ and the mam-mæ, as evinced in the same changes, as well as in the evolution of organs that takes place at puberty; but who could have divined the sympathetic effect between those organs, recently referred to by Dr. Rigby, from which it would seem, that practical advantage is to be derived, in the suppression of uterine hemorrhage. I allude to the sudden and powerful contraction, which, he affirms, is excited in the uterus, when in a state of inertia, by applying the child to the breast. A common saying, amongst nurses—that “the child brings after pains”—shews, that this sympathy has been a matter of observation amongst the vulgar; but Dr. Rigby’s attention was first directed to it by Carus, who in his *‘Gynækologie’* recommends the application of the child to the breast, to promote the expulsion of the placenta. “In cases,” he remarks, “where there has been considerable disposition to hemorrhage after labor, from noncontracted uterus, and where I have been afraid to leave the patient, lest flooding should come on in my absence, I have been for the last two years in the habit of ordering the child to be put to the breast, as soon as the clothes, &c. were changed, and herself comfortably settled in bed, feeling that I thus diminished the chances there might be of any hemorrhage occurring. It was not, however, till last year that I began to see the practical importance of this sympathetic connexion between the breast and uterus in its full extent. Having had two or three cases of severe hemorrhage after labor, from uterine inertia, which had to a degree resisted all the common modes of treatment, and where permanent contraction could not be induced even by repeated injections of cold water and vinegar into the vagina, I determined to see what effect the application of the child to the breast would have upon the relaxed uterus, and was agreeably surprised to find the observation of Professor Carus confirmed in its fullest extent,—firm and permanent contraction having been immediately produced in every case.”*

Admitting, then, that such a sympathy exists, how important it is, in a therapeutical point of view, to be acquainted with it! It is not, however, always easy to apply the child successfully to the breast soon after delivery. The young being is awkward, and will not seize hold of the nipple. In such cases, the appli-

* ‘London Medical Gazette,’ March 1834; and ‘American Journal of the Medical Sciences,’ August, 1834.

cation of the breast pump would probably be an efficacious substitute. It is certainly worthy of a trial, and may be found of useful application in every case of hemorrhage, which is dependent upon a want of due contraction in the parietes of the uterus.

The importance of discovering the precise play of sympathies between different organs is strikingly exemplified by this case; and observation may, hereafter, point out many, which may aid us largely in the therapeutical use of our remedial agents. At present, we are greatly in the dark, and most of the suggestions on the subject have been hazarded rather from particular theoretical considerations than from observation.

In diseases that are metastatic, constituting—what have been termed, by some—the ‘changeable phlegmasiæ,’ we might seem to have an index to the proper organ on which to apply our revulsives. In the cynanche parotidæa or ‘mumps,’ after the inflammation has existed for some time in the parotid gland, it is apt to quit its seat, and to pass to the testicle of the corresponding side in the male, and to the mamma in the female. In the same way, rheumatism or gout will appear to leave the joints, and attach itself to some internal structure. In all these diseases, there is a tendency, in particular structures, to be morbidly implicated; and they, who believe in metastasis, consider, that there is a true translation of the disease from one part to the other, or at least a decided predominance of irritation in the organ sympathetically irritated.* Others consider that it is a mere extension of the disease to structures liable to be affected by it;—such extension occasioning a diminution of diseased action in the part primarily affected. For example, the tissue, composing the heart and the parts about the joints, is liable to be attacked by rheumatic inflammation, and, when the inflammation has been seated in the joints, for some time, and symptoms of pericarditis supervene, it is conceived, by one party, to be owing to the retrocession of the articular inflammation or to metastasis, whilst the other party maintains, that the affection of the heart is simply owing to an extension of the articular inflammation, which is more or less diminished in the part first attacked, owing to its diffusion over a larger surface.

But, in whatever light we regard it, whenever an affection, esteemed metastatic, has diminished in, or left, any part, and

*“The organs sympathetically irritated, may contract a degree of irritation greater than that of the organ from which they derive their irritation: in these cases, the disease changes its seat and name; these are metastases.” Broussais, Prop. 92.

become prominent in a more important organ, the indication to be fulfilled is, in the minds of most practitioners, to call back the irritation to the part primarily affected, by the application of revulsives;—to the parotid region, for instance, where the testicle or mamma has become inflamed; and to the joints, in cases of gouty or rheumatic inflammation, translated or extended to internal organs. The remedy, however, is not as clearly indicated as might at first appear. The organs, concerned, seem to possess this sympathy only under particular morbid conditions, between which, and the irritation excited by revulsives, there may not be the slightest similitude; and this accounts for the want of success we are doomed to experience, whenever we attempt to recal a changeable phlegmasia back to its former seat. In accordance with the views generally inculcated, I have, over and over again, attempted, by revulsives, to bring back inflammation to the parotid, in cases of retrocedent cynanche parotidæa; and to the joints, in cases of gout and rheumatism, but I do not recollect, either in my own practice, or in what I have witnessed of that of others—in public or in private—a solitary instance where such an appeal has been responded to; and, accordingly, I now attend exclusively to the superinduced affection, and never, for a moment, suffer my attention to be diverted from it; for, in the cases of pericarditis especially, which are so often observed as concomitants of acute rheumatism, any loss of time might necessarily be fatal. It is, indeed, by no means clear, that the artificial irritation, which we excite by revulsives, can be practised, in such cases, with perfect impunity. We must bear in mind, that the inflammation, which has changed its seat, was originally situated in the part we desire to irritate artificially; and it might be asked, with much propriety, whether the revulsive irritation we induce may not equally pass to the organ secondarily implicated, and add to the mischief already existing; so that in truth, revulsives might be less safe and efficacious there than when applied to other parts of the economy.

Some contrariety of sentiment exists amongst Therapeutists, as to the part to which epispastics should be applied; some maintaining, that they should be placed as near as possible to the seat of the disease; others, at a distance from it. A good deal of this discrepancy of sentiment has been owing to the varying views entertained of the precise *modus operandi* of epispastics,—and especially of vesicants—by different practitioners. By some, who believe, that inflammation is dependent upon debility of the

extreme vessels, and that this is always the prominent lesion, the epispastic is applied as near as possible to the seat of the disease, with the view of stimulating the debilitated vessels to a more healthy condition. The same practice, though on less intelligible grounds, has resulted from the revulsive theory;—it being imagined, that the nearer the artificial irritation is to the seat of the disease, the more powerful and satisfactory will be the revulsion.

This appears to have been the view, entertained by most of the modern writers on Therapeutics,* but it seems to me to be neither consistent with true theory, nor with observation of facts. The recommendation, indeed, appears to have been handed down from one writer to another, without sufficient reflection, and hence we discover no clear ideas regarding the mode of action of revulsives, or their therapeutical application. Whilst Dr. Thomson affirms—without offering any reason for the affirmation—that “blisters, by whatever means they are raised, should be applied as near as possible to the affected part;” he observes, a few pages before (p. 535), that “the benefit which blisters produce is to be attributed to their local stimulant action as counter-irritants, and the sympathy which exists between the skin and the mucous and serous membranes. This was known to the ancients. Hippocrates, who invented them, applied them in the hope of transferring diseased action from the interior to the surface, or, as it has been termed, on the doctrine of revulsion.”†

Similar obscurity is perceptible in the observations of Professor Chapman on this subject. “It will be right,” he says, “in local affections, and in the whole of the phlegmasiæ, to apply the blister as nearly as possible over the immediate seat of the complaint, its efficacy thereby being much increased: but wishing to interrupt trains of morbid association, as in most of the diseases of periodical recurrence, to the extremities alternately will answer better. *Equally does this precept apply in the cases where revulsion is the object.*”

Since this paragraph, however, was written, the author's views, regarding the action of epispastics, have undergone some change. In an article on *tic douloureux*, published in the ‘*American Journal of the Medical Sciences*,’ for August, 1834, he observes:

* Eberle, Edit. cit. ii. 196; Chapman, Edit. cit. ii. 29; Thomson, Op. cit. ii. 546.

† Doctor Thomson is not, however, consistent in this matter. When treating of the employment of epispastics in apoplexy, he says:—“In applying blisters, or employing other epispastics with this view, I have found them *more beneficial when applied to the nape of the neck than upon the head.*” Op. cit. p. 572.

“the common practice of establishing issues immediately on each side of the affected vertebra is bad. They should be placed some inches from it, and the same remark applies to leeching, being near to, or in contact with it, instead of operating as divellents or counterirritants, they may have a contrary effect, exacerbating the irritation of the spinal marrow; but especially the intensity of inflammation, which is so apt to follow caustic issues, should be avoided. By this circumstance alone, I have, in more than one instance, seen neuralgic pain, and the paralytic state, conspicuously increased, and each again relieved, on the reduction of the inflammation, by emollient poultices, &c. Moxa issues are greatly to be preferred to those produced by other means. They are less painful, more manageable, and decidedly of superior efficacy.”

This last opinion appears to me more philosophical, and the most in accordance with true experience. If we are desirous of irritating the vessels of any organ, we apply the blister, if possible, so near to the organ, that we may implicate branches of the same vessels and nerves as proceed to the affected part. If, on the other hand, we wish to produce revulsion or counterirritation—as is almost invariably the case, when we have recourse to epispastics—we carefully avoid applying them to branches of the same vessels and nerves, and seek out a surface where no such identity of nervous and vascular supply can exist. We can thus understand, that a blister to the shaved scalp may be improper or proper, according to the precise character of the disease of the encephalon, for the removal of which it may have been applied. In encephalitis, for example—affecting the encephalon or its membranes—a vesicatory, applied to the head, is too near the seat of the disease, and can scarcely fail to add to the internal mischief, inasmuch as it occasions an augmentation of vital manifestations towards the part irritated, which can only be accomplished by increasing those of the whole head, and consequently of the part diseased. Besides irritative irradiations cannot fail to proceed through the media of communication between the exterior and interior of the head; and hence it is, that a *coup de soleil* produces encephalitis;—the erethism, occasioned by the solar rays, being speedily propagated to the organs within the cranium. In like manner, the irritation of the vesicatory, and of exciting ointments applied to the head, in cases of porrigo, has produced serious mischief of the brain by the same mode of extension; and, in inflammatory affections of the joints, revulsives

applied over the joint, may add to, rather than detract from, the mischief.

In the generality of cases, however, in which cutaneous revulsives appear to be indicated, there need not be much apprehension entertained from placing them as near the affected organ as is practicable. Thus, in inflammation of the abdominal or thoracic viscera, the nervous and vascular distribution is so different in the parietes from what it is in the viscera, that we need not hesitate to apply our epispastics to the former, whenever the state of internal mischief suggests the propriety of their employment. But, although, as we have seen, blisters may be improper in cases of violent encephalitis, before the disease has terminated in effusion, they may be clearly indicated after such termination, or whenever there is reason to believe, that advantage may be derived from exciting the organic actions of the encephalon or its meninges. In the last stages of the encephalitis, to which the name 'hydrocephalus acutus' has been given by many nosologists, the use of epispastics may be properly invoked, but, unfortunately, in too many cases, without any well founded prospect of benefit. In like manner, whenever the functions of an organ have to be excited to greater activity, the application of a blister so near the organ, that the stimulation may be felt by it, may be had recourse to with advantage; but this plan of management would obviously be improper, when the organ is in a state of superexcitation.

I have elsewhere remarked, that in external inflammations, in which the dilated state of extreme capillary appears to predominate over the excited condition of the red vessel communicating with it, we often find the direct employment of excitants followed by the most happy results. In this way, blisters produce their good effects in superficial paronychia, and in erysipelatous inflammation. In these cases of tegumentary inflammation, such a dilated and atonic condition of the extreme vessels generally, if not always, exists, which the stimulation of the vesicatory is often successful in removing. There are, doubtless, many cases of inflammation of internal organs, which would, likewise, be relieved by the application of stimulants, but the organs concerned are generally so important to the economy, and so intimately associated, by sympathetic relations, with the organs of the vital functions, that we dare not venture on their administration. Occasionally, however, we observe the reckless empiric exhibit them boldly in such affections, and we are surprised, that the extensive mischief, we had anticipated, has not supervened on their

use. We could understand, that gastritis might possibly be relieved by them, in the same manner as cutaneous inflammation, but we are astonished to discover, that their secondary effect,—that of hurrying the general circulation and augmenting the inflammatory tendency,—has not taken place to the degree we had expected. The efforts of a class of empirics, now common in every section of the United States, has taught us one useful lesson,—namely, that there are some diseases, usually and correctly esteemed inflammatory, and especially certain stages of such diseases, that are not aggravated by the exhibition of powerful stimulants, which seem, at times, to act more as revulsives, by exciting the lining membrane of the stomach, and thus detracting from the intensity of mischief existing elsewhere.

From what I have said of the *modus operandi* of revulsives, it will appear, that when we have recourse to them, in inflammatory affections of internal organs, we avoid applying them so near the seat of the disease, that it can be increased by their direct action; much farther than this our information does not extend; my experience, however, has induced me to infer, that the same amount of irritation artificially excited, has had pretty nearly the same therapeutical agency, whatever may have been the part, chosen for such irritation. The selection of a seat for the artificial irritation has, indeed, been sufficiently whimsical. It is an old remedy to apply a garlic poultice to the thumb, in cases of toothache; the vesicatory is put behind the ear in ophthalmia; but, many cases of ophthalmia, which have resisted the artificial irritation, induced in this situation, have yielded to a vesicatory on the nape of the neck; and others, which have resisted both, have yet been removed by the same agent applied to the interior of the arm: perhaps, however, in these cases, the benefit has accrued from the aggregate of irritations rather than from any one of them. The origin of the choice of the interior of the arm was probably owing to the same idea, that gave occasion to the epithet 'cephalic' to one of the vessels of the arm,—in other words, to some fancied connexion between it and the head; but the good results are probably owing to the thinness of the skin, and to the greater sensibility of the arm, which render it a favorable situation for the induction of revulsion. Again, by common consent, we apply our revulsives to the feet and legs, in apoplexy and other cephalic affections, whilst, in the same diseases,—where abstraction of blood by means of leeches, and some degree of counterirritation are demanded,—the French prefer, that the blood should be drawn from the region of the anus. With them, great

er attention is paid than with us to 'revulsive' bleedings, and, although their notions on the subject may be carried to a somewhat chimerical extent, there can be no doubt, that a revulsive influence may be exerted, in many cases, by a proper choice of vessels; the afflux to the vessels, which are discharging the blood, deriving somewhat from organs to which it is already directed in too great quantity or force.

In the case which I before offered—of encephalitis liable to be augmented by epispastics applied to the shaved scalp, we rarely observe, in American or British practice, the revulsive applied at a greater distance than to the nape of the neck. There is no reason, however, why this part should be preferred to the top of the sternum,—where I am in the constant habit of applying it in such cases, and, as I conceive, with full advantage, whilst there is an overwhelming objection to the former situation,—in the circumstance of its rendering the position on the back uncomfortable, and, at times, impracticable, owing to the abraded surface being subjected to attrition on every change of position of the head. Practitioners have been so little in the habit of reflecting on the mode in which epispastics produce their salutary agency, in these cases, that they rarely select a more convenient, and yet equally effective, centre of irritation, at a greater distance from the seat of the mischief. Many of the French writers recommend blisters to be placed upon the arm, or between the shoulders, in encephalitis; but it has always appeared to me, that the top of the sternum is perhaps the least objectionable situation, where counterirritants are demanded in head affections, accompanied by exaltation of the organic actions.

After all, in the general rules for the use of revulsives, and their adaptation to special morbid conditions, the physician, as Bégín* has properly remarked, must be altogether guided by sound physiological principles.—“They alone can complete the solution of the great problem concerning revulsions; render this system of medication more certain, and prevent the inconvenience, which, in many cases, still follows its employment.”

It is clear, that any agent belonging to the class of excitants, when properly administered, is capable of exerting a derivative effect, and may be beneficially used, whenever, owing to the concentration of vital manifestations on any important organ, it is considered proper to divert them elsewhere.

* Op. citat. sect iv. chap. i.

After what has been said of the great principles of action of revulsives, and of epispastics especially, their adaptation to particular diseases will be sufficiently intelligible. Yet, doubt in several instances, we shall find, exists, as to the propriety of their application in certain diseased conditions. Such doubt, however, ought scarcely to be indulged, and it will be generally found to yield, if we bear in mind the great facts and considerations on which I have already expatiated.

During the paroxysm of an intermittent, revulsives can rarely be demanded. When the cold stage, however, is unusually protracted, and no signs of reaction make their appearance, about the time when they might be expected,—and especially in the pernicious forms of intermittent, which occasionally prove fatal in the congestive condition of the cold stage,—substances, belonging to this class of medicinal agents, may be had recourse to with advantage, for the purpose of concentrating the vital manifestations towards some point of the cutaneous surface, and thus detracting from the accumulation, that may be present in the internal organs.

With these views, epispastics may be applied over the epigastric region ; this part of the cutaneous envelope being chosen, in consequence of its vicinity to the epigastric nervous centre, in which, rather, perhaps, than in the stomach, we ought to place the ‘centre of sympathies.’

The epispastics, which we choose in the congestive stage of an intermittent, is usually the flour of mustard, applied in the form of the ‘sinapism’ or ‘mustard poultice ;’ and we select it, because its operation is more speedy, than the plaster of cantharides. The irritation, produced by it in the nerves and vessels of the skin, is soon extended in all directions ; the ganglionic and cerebro-spinal system of nerves feel the influence, and, in this way, new force is communicated to the vital movements : reaction becomes established, especially if recourse be had, at the same time, to appropriate adjuvants, and all apprehension of death, during the stage of congestion, vanishes.

The same remarks are applicable to similar conditions occurring in diseases of a different character ; and, accordingly, whenever a state of depression, or of collapse, occurs, which is dependent upon mischief existing in some of the great systems, or in some particular organ or part of such systems, we endeavor to derive from the organ or part morbidly implicated, and to attract the vital manifestations to some unimportant part of the frame

by means of the artificial irritation, which epispastics are capable of producing. Hence it is, that the practitioner invokes their use in cholera, both during the state of inflammatory irritation in the mucous membrane—as indicated by the copious exhalation and secretion from the mucous membrane of the alimentary canal, with the pulse still exhibiting sufficient energy of circulation,—and during the stage of oppression and depression of the vital forces, which characterizes the state of collapse:—in the former case, to have the benefit of the revulsive medication; and in the latter, of both the revulsion and stimulation, which epispastics are capable of effecting. In all cases, where time is valuable, and the revulsion important, the practitioner has recourse to rubefacients whose action is speedy; but, where the case is not so urgent, vesication, by means of cantharides, is at times preferred. I have already remarked, that the latter operation or agency on the frame is essentially that of the former; and that, where great prostration exists, the separation of the serum, which is occasioned by blisters, is rather an objection than an advantage. It would be well, therefore, perhaps, that the practitioner should, in all such cases, place his confidence altogether in the former; and this appears to be the feeling of the Therapeutists of the present day. Rubefacients are, indeed, now employed in states of disease, in which, a century ago, they would have been looked upon as wholly inoperative. At that time, the idea, almost universally prevalent, was, that the good effects of blisters—and the same applies to issues, setons, &c.—were dependent upon the discharge; and, as rubefacients produced no discharge, they were necessarily discarded. Here, again, Therapeutics reconducted the speculatist into the true path; and taught him practically, that rubefacients are often valuable revulsives; and, accordingly, as in too many cases, the opposite exclusive view was embraced by many, and it is now asserted by several, that no good whatever is occasioned by the discharge,—the whole benefit being ascribable to the counterirritation, the derivation or revulsion induced. Certain it is, that the main, if not the sole remedial effect, exerted by cutaneous revulsives, in the cases we are considering, would seem to be independently of, and notwithstanding, the effect produced on the system by the separation of the fluid of the vesication from the mass of blood.

During the state of exalted action, which succeeds the cold stage of an intermittent, recourse to this class of remedial agents is rarely necessary, and the same remark applies to the sweating stage. Complications rarely exist, which can demand the ad-

ministration of revellents; and, if any such should arise, the practitioner has to be guided by the great general principles and rules, which inculcate their adoption.

The last remark applies, also, to the accidental complications, that may exist during the stage of apyrexia. Where an individual has long been resident in a malarious region, or has been subject to repeated attacks of intermittent fever, visceral infarctions and indurations are apt to be induced, which may act as *foci* of irritation, and may prevent the tonics, that are administered, from exerting their proper agency on the nervous system, so as to break in upon the morbid catenation, which keeps up the periodical exacerbations. In these cases, it may be necessary—should the disease be of the usual indolent character, which we witness in the indurations of the spleen and liver, to which the vulgar have usually given the name ‘aguecake’—to attempt their removal by revulsive remedies; and, with this view, epispastics are occasionally applied over the abdomen; or revulsives of a more general nature are adopted,—as the mercurial preparations,—which, by exerting their specific stimulation on the glandular and secretory system in general, induce a new artificial morbid condition in the system, that derives from the one already existing, and occasions its removal.

Such are the remedies usually employed in these cases, as well as in all those, that indicate the presence of local mischief; and for which such a system of medication seems to be more appropriate than the vigorous employment of antiphlogistics. If we inquire into the exact etiology of these visceral engorgements, we may often find, that they are really only the results of a morbid condition elsewhere, as in the lining membrane of the alimentary canal; the irritation extending from it to the parenchymatous viscera, and occasioning inflammation and its results in those organs: but, in whatever manner induced, and even if complicated with some degree of gastro-enteritis, the plan of treatment recommended is best adapted for their removal.

It is not, however, to such accidental complications only, supervening in intermittent fever, that revulsives have been regarded as appropriate. They have been advised in the apyrexia, with the view of preventing the subsequent paroxysm. The mode, in which they probably act, in such cases, is by attracting the nervous and vascular afflux to the part, and concentrating the attention of the patient to the new point of irritation. Their operation is exerted in the same manner as the mental tonics produce their effect, and as the animal magnetizer, Perkin-

zer, &c., have successfully operated on their patients. In cases like these, the remedy ought obviously to be applied as near to the anticipated paroxysm as possible ; and, therefore, epispastics, which produce their effects at once, are indicated ; those, which, like ordinary blisters, require hours for the accomplishment of the necessary degree of irritation, and which have that irritation diffused through a period of hours, are by no means as well calculated for destroying the continuity of the chain, as those, that make a rapid and powerful impression upon the nerves. A few drops of hot water let fall upon the naked surface, or the actual cautery applied a little before the expected paroxysm, would, accordingly, be the most appropriate agents ; but the acquired dread of fire—although one of the essentials to their due efficacy—occasions so much repugnance to their employment, that they are scarcely ever used ; and, indeed, we possess in agents belonging to other classes—especially to the class of tonics—such efficient means for breaking the morbid chain, that we very rarely have recourse to agents of the class we are now considering ;—the mental revulsives or mental tonics being almost wholly handed over to the followers of animal magnetism, and its kindred arts for practising on the minds of the feeble, and for the encouragement of mystery, credulity, and delusion.

In remittent, and continued fevers, epispastics are not indicated during the violence of action, which usually attends the first periods ; unless, indeed, in those fevers, which are typhoid from the commencement, and are complicated with local mischief, when they may be demanded, especially after bloodletting—general or local—has been premised. It is chiefly in the latter periods of continued fever, when the violence of febrile irritation has, in some measure, passed away, that revulsives, applied to the cutaneous surface, may exert a salutary effect, by localizing that which has been general, and concentrating the disordered actions towards one point—and that an unimportant one—of the economy. The practice, pursued by some individuals,—of attempting to derive from every organ that is incommoded by the irregular afflux of blood, which occurs in the course of every remittent fever, by the application of an epispastic, whenever symptoms of such partial afflux present themselves,—is not, I think, judicious. It is apt to keep up the irritation, and to add to the disordered movements, by those irradiations, which have been mentioned, as capable of being induced by epispastics, and which, in the opinion of Broussais, add to the in-

tensity of inflammation in the gastro-enteric mucous membrane. There is a tendency, in all these fevers, to run a definite course, and, unless disorganizing inflammation occurs in some part of the organism, to terminate in health. The true method of treatment is, therefore, to allay all irritations, wherever existent, as effectively as possible, and not to adopt any course, during the period of superexcitation of the organic actions, which can augment them. But when, as I have said, these disordered movements have persisted until the period at which the disease ordinarily yields, and appear to be likely to be farther prolonged, the application of revellents, which excite a new action in the system generally, or in some part of it, will frequently destroy the chain, and restore all to harmony. It is thus, that a blister acts beneficially in such cases,—not as an excitant proper, as I have elsewhere shewn; and that we have the valuable effects of mercury, when pushed so as to affect the system in these protracted cases. If we can once succeed so far as to induce a new action by means of this agent on the system generally; if we can cause the gums to fall away from the teeth; the mouth to be slightly sore, and a mercurial fever to be established, we may, generally speaking, look forward, with certainty, to a favorable termination; owing to the incompatibility of the original and the artificial irritation in the system at the same time. The very fact of our being able to induce a mercurial disorder is, of itself, an element of favorable prognosis; for, in the worst cases of continued fever, we may, in vain, attempt to arouse the action of the absorbent vessels. The gastro-enteric mucous membrane—and indeed the whole system—is so excited, that no absorption can be effected, whatever may be the amount of mercurials exhibited.

These circumstances have led to the belief, strenuously advocated by some, that, so long as high febrile action continues, we cannot affect the system by mercury, and that when it is so, it is an evidence, that the fever has abated, or is about to terminate—not that the mercury has broken in upon the morbid catenation.

In the exanthematous fevers, revellents are chiefly employed for the removal of local mischief when occurring in the course of the disease. In all these complaints, the mucous membranes are more or less inflamed, and, at times, this is to such an extent as to require the ordinary treatment adapted for internal inflammation. It must be borne in mind, however, that in these diseases, when occurring in young children, the dermoid system is very liable to assume gangrenous inflammation, under the irritation of

an epispastic. It behoves us, therefore, to be cautious; to be satisfied, that it is imperatively demanded; to place some substance between it and the skin—as before inculcated—and not to let the plaster remain on too long. Those precautions are proper, indeed, whenever it is esteemed requisite to apply blisters in the diseases of early childhood; for, although such disastrous results are more likely to occur, where the cutaneous system is morbidly affected, they may supervene in diseases in no respect exanthematous.

It is in the different phlegmasiæ, that revulsives are most frequently, and advantageously had recourse to; and there is not an agent of the class, which has not been employed in particular cases.

Whilst the inflammation is extremely active, our attention must be directed to the employment of those great sedative agents, on which our main reliance is placed, and properly placed; but, when the violence of the phlegmasia has been got under, and an exaltation of the vital forces still continues in the diseased part, revulsives may be employed with the best prospect of success. I have before observed, that many of the practitioners of Continental Europe are of opinion, that blood, drawn from particular parts of the body, in diseases of certain organs, is more efficacious than when the same quantity of fluid is taken from other vessels. This system of revulsive bloodletting is a relic of antiquity. Of old, the vein from which the blood was to be taken was specified; and, at one period, great discussion was carried on, respecting the propriety of bleeding from the vein of the arm of the affected side in pleuritic inflammation, or from the vein of the opposite arm. Strangely enough, an appeal was made to the Emperor Charles IX.; but, before he delivered his judgment, he was bled for pleurisy, and died; and his death was of course ascribed to the blood having been drawn from the wrong side. These injudicious controversies are no longer carried on; and practitioners have settled down into the opinion, that the effect upon the system is the main thing to be regarded; yet Conradi* maintains, that in thoracic inflammation blood should be drawn from the arm of the affected side. This is a topic, however, to which I shall advert hereafter. We shall, then, see that there may be cases in which greater advantage may be derived from emptying the vessels of the inflamed organ, than where the blood is taken from a more distant vessel. It is 'revulsive bleeding'—as it has

* 'Handbuch der allgemeinen Therapie,' s. 112.

been termed,—which alone concerns us at present. Perhaps American, and British practitioners attach too little importance to this matter, although too much weight is doubtless given to it elsewhere. If we are in the habit of exciting a revulsion in the feet, or in the rectum, in encephalic affections, there is some shew of reason in our drawing blood from the feet or from the neighbourhood of the anus; and when I have seen it practised in France, by opening a vein in the foot, and immersing it in warm water; or by applying leeches around the verge of the anus, a greater effect, it appeared to me, was produced on the system by a smaller loss of blood, than where the abstraction of the fluid was made from the exterior of the head, for example. Many of the European practitioners are firmly of this opinion, and they, consequently, have recourse to these revulsive bleedings in all such affections.*

Although doubts may be entertained regarding the propriety of placing any stress upon the revulsive effect of general bleeding, there can be none as respects the action of topical bleeding. Often, indeed, when we are in doubt regarding the propriety of general bleeding, and when still the degree of phlegmasia seems to require the farther abstraction of blood, we can derive the most striking advantage from the combination of revulsion and evacuation, which cupping or leeching affords. It is, in truth, precisely in such cases, that we avail ourselves of the use of these mixed agents, rather than of the more powerful simple revellents, which we usually postpone, until the inflammatory action is more decidedly reduced. When, therefore, we wish still farther to reduce the quantity of circulating fluid, or the activity of the circulating forces, and, at the same time, are somewhat afraid of general bloodletting; and when we do not consider the condition such as to admit of the application of the more active counterirritants—as blisters—we have valuable agents in those means, which remove a small quantity of blood from the vessels, and are, at the same time, decidedly revellent in their action; and it has always seemed to me, that the good effects of cupping and leeching, in many cases of internal inflammation, have been as much dependent upon the latter operation as upon the former. Even

* Revulsive bleedings from the neighborhood of the anus were so common, at one time, in Great Britain, as to be alluded to in the popular songs. Thus, a wit of the time of the 'Rump parliament'—alluding to Cromwell's hunting the members out of the house by military force—observes:—

“Our politic doctors do us teach,
That a blood-sucking red coat's as good as a leech
To relieve the head, if applied to the breech.”

the simple application of the cups, without the scarificator, constituting the operation of 'dry cupping,' is often signally salutary, and where there is, in addition, the irritation, or series of irritations, produced by the wounds of that instrument, the revulsion is still more marked.

In the same manner, the punctures made by leeches, are the source of salutary derivation.

It has been the opinion of many Therapeutists, that local bloodletting is of but little service, compared with that operated on the larger vessels; and that the effects of both are proportionate only to the quantity of blood taken. Were this the sole effect, which local bloodletting is capable of producing, the objection would be valid; but such is not the fact. I have already remarked, that the revulsion is a most important agency;—not less so, perhaps, than the depletion; and hence cupping and leeching may be employed successfully in cases, in which the same, and even a larger amount of blood, taken from the arm, would be far less efficacious.

When, therefore, we are desirous of evacuating the vessels, and of diminishing the vital actions generally, and through them, those of any part in particular, affected with hyperæmia, we can employ no substitute for general bleeding; but where the inflammatory or subinflammatory irritation is not to such an extent as to demand the use of the lancet, or to require much loss of blood, topical bloodletting may still be employed without hesitation. In all fevers, consequently, where there is a complication of local hyperæmia, but not perhaps to a great extent, we adopt the topical revulsive bleeding, unhesitatingly, and largely; and, in the practice of Broussais, it is used in most cases of fever to the exclusion of the lancet; leeches or cups being generally applied over the epigastric region, in accordance with the views of that pathologist, who, as I have often observed, places the local origin of all fevers, or of most fevers, in the gastro-enteric mucous membrane.*

There is not a variety of revulsion, which has not been embraced in the management of the phlegmasiæ. I have already remarked that every local stimulant—whatever may be the organ or tissue, on which it acts by preference—is a revellent; and, accordingly, all the local stimulants are used in the treatment of inflammation. Epispastics, too—our great counterirritants—are employed un-

* The like treatment is suggested by the theory, which regards dothinenteritis, or follicular gastro-enteritis, as the cause or essence of ataxic and adynamic, or other fevers.

der the same circumstances, and the operation of all, in the removal of morbid mischief, is alike.

As regards the local stimulants, we rarely have recourse to them as revellents, until the time has come when we can adopt advantageously the whole revulsive system of medication. There are cases of inflammation, however, in which the inflammatory catenation may be at times severed, at an early period, by revulsives. My friend, Dr. Thomas—lecturer on obstetrical medicine in this city—informs me, that in cases of mastitis or mastodynia apostematosa, occurring after delivery, when the symptoms have strongly threatened suppuration, he has completely and suddenly removed the hyperæmia, by a combination of the sulphate of magnesia and the tartrate of antimony and potassa, given so as to produce full vomiting and purging. In this way, an afflux of vital activity was provoked towards the abdominal organs, which were thrown into the state of artificial turmoil, and a corresponding derivation took place from the inflamed mamma. A similar course of treatment is said to have been found useful even in cases of peritonitis, but I confess, notwithstanding the salutary revulsion that might be operated by the vomiting, I should be afraid, that irritation, excited in the intestinal canal by the cathartic, might be propagated, by contiguous sympathy, to the part laboring under inflammation, and that more harm might accrue from the excitation, thus occasioned, than good from the revulsion.

Under the different divisions of ‘local stimulants,’—as they have been termed by Murray,—I have alluded to the revulsion they are capable of operating, and to the cases of disease in which they have been employed by virtue of this operation. It will not, consequently, be requisite to dwell upon them here. I may merely observe, that whenever we look upon internal revellents to be indicated in cases of hyperæmia of any organ, we generally choose the lining membrane of the intestinal canal, on which to effect such revulsion; and, accordingly, emetics and cathartics are our most valuable internal revellents.

In all the varieties of internal inflammation, when the exaltation of organic actions has been reduced by an appropriate medication, epispastics are employed; and the blister of cantharides is usually chosen for this purpose. Sometimes, however, the nitrate of silver, or the deutoiodide of mercury, is selected, where cantharides are known to irritate unusually, or where the object is to excite vesication more speedily.

Of the best mode of applying those agents, and the great general principles to be attended to, I have already spoken.

When we are desirous of maintaining a succession of revulsions, or a constant revulsion, we employ either repeated blisters, or keep the blistered surface discharging, by the application of some blistering salve, or we have recourse to some of the other epispastics, as the moxa, seton, issue, tartarized antimony ointment, &c., &c. The last agent is well adapted for cases of chronic inflammation—as of the substance of the lungs—because, whilst the pustules, induced in any one part of the exterior of the thorax, or elsewhere, are going through the stages of increment and maturation, a fresh crop can be elicited on some other part of the chest; and thus a succession of irritations can be developed, which, as I have before said, is more beneficial than one that is more permanent. In these, and similar cases, therefore, I would prefer pustulation, effected by this ointment, to the issue or the seton,—which, when once introduced, are permanent, so long as they are permitted to exist; and, as their good effects are mainly owing to the irritation and consequent revulsion, which they operate, and as the system soon becomes accustomed to the discharge, whilst advantage can scarcely be derived from that, it is better to select the more cleanly and less objectionable counterirritants. It is at times, however, difficult to induce the patient to submit to any kind of epispastic, or to persevere in the use of those, which, like the ordinary blister or the tartarized antimony, may require a repetition of the application. It may, therefore, be advisable to fix upon a method of revulsion, which, when once established, can be maintained without difficulty; and, with this view, the issue or the seton is often selected, especially in hospital practice. There are situations, too, in which there may be some difficulty in our having the remedy properly applied, unless it is established at once; when the patient, for instance, is compelled to subject himself to the inconvenience of a constrained posture,—as where the vertebral column is affected with chronic inflammation, and the bones themselves with caries. In such cases, we insert a seton, or establish an issue, on each side of the affected vertebra, and keep this open as long as we think the diseased condition requires it. Still, even in these cases, I consider that a succession of revulsions would be more effective than this continued irritation, but we choose this form of epispastic merely, I say, in consequence of the convenience that attends its application.

The moxa is rarely employed in the more active inflammations.

It is more commonly used in those cases, in which the seton or the issue is demanded; and where it is desirable to break in upon a morbid catenation, which has been long existent.

A centre of fluxion is formed in all these cases; the vital manifestations are directed towards the part artificially irritated; and, at times, the derivation is so complete, that the disease is removed, as it were, by a charin. In this way, the moxa occasionally produces a good effect in mania. I have applied it in one or two cases with the effect of so completely directing the attention of the maniac to the cauterized part, and towards the artificial irritation, there established, that it has broken in upon his abstractions, aroused him to consciousness, and been followed by markedly beneficial results.

What I have already said of the general rules for guidance in the application of revulsives, near to, or at a distance from, the diseased organ, will render it unnecessary to say more here, than to remind the reader, that where revulsion has to be operated, the counterirritant must not be applied over the same vessels and nerves, that are concerned in the lesion. A part of the body must be chosen, whose vessels and nerves are not so connected with the seat of the disease, that when the nervous and vascular afflux is solicited into them, the exaltation of action may be participated in by those of the part affected.

In chronic ophthalmia, it is very common for the unprofessional to select the interior of the arm as the best locality for a seton or issue, but, although this situation may have been chosen originally for the reasons before mentioned, connected with the idea that some more particular relation exists between the vessels of the arm and those of the head, the custom is kept up, perhaps, in consequence of as little inconvenience accruing from the presence of the issue there, as in any part of the economy, that could be selected for the purpose.

As in cases of long sustained febrile irritation, so in those of an inflammatory character, when they have become chronic, mercury is a valuable revulsive. By the new action which it establishes in the secretory apparatus, it breaks in upon the morbid condition more effectually than any other agent. It is, in such cases, too, that we frequently see the most marked results from the revulsion effected by change of air, and of all the physical influences surrounding the individual; but this course can be adopted only, when all active disorder has subsided.*

* See the Art. 'Atmosphere,' by the author, in Hays's 'American Cyclopedia of Practical Medicine.'

From the great leading rules laid down with regard to the employment of external revulsives, in the phlegmasiæ in general, it is unnecessary to occupy time and space with the special consideration of individual diseases. I may allude, however, to one of those singular discrepancies in medical opinion, of which we have, unfortunately, too many examples, but which I think generally owe their origin to defective observation or reflection, or to both.—I mean, as respects the propriety of employing epispastics in rheumatism and gout.

“Of the utility of blisters in rheumatism,” says Professor Chapman,* “no one doubts. Yet even here they are productive of harm, if prematurely applied, and, where it can be conveniently done, should be preceded by general evacuations and local detractions of blood. My conviction is, that they are much better adapted to chronic than acute rheumatism, almost always proving serviceable in the former instance, and especially when they induce the suppurative process.”

“By some writers it is recommended to vesicate the affected part in regular gout, and, as it proves so beneficial in some analogous cases, we might imagine, that it would be attended with the same results; on trial, however, I have been disappointed, and no longer employ applications of this nature. It has, indeed, been alleged, that they have the effect of repelling the disease on some internal part of more value to life, and hence are hazardous measures. But such applications are the very best means to invite and fasten down, if I may use the expression, gout on the extremities, and I can have no idea of a remedy blowing hot and cold in this way.”

But let us hear the antithesis to this:—

“In gout and rheumatism, the application of epispastics, whether vesicants or rubefacients, is more problematical. “Blistering,” Dr. Cullen remarks, “is a very effectual means of relieving and discussing a paroxysm of the gout, but has also frequently had the effect of rendering it retrocedent.” I have little experience of the truth of this observation in gout, having scarcely ever ordered the application of epispastics; but, in acute rheumatism, I have so frequently seen the most alarming translation of the inflammation to the vital organs, that I cannot too strongly denounce their employment in this disease.”†

The reader is referred to a preceding page, for the analysis I have endeavoured to make of the action of revellents in the

* Op. cit. i. 35.

† Thomson, Op. citat. ii. 568.

changeable phlegmasiæ. They are markedly applicable to the present inquiry,—both rheumatism and gout belonging to these very phlegmasiæ. It was there remarked, that it is by no means clear, that the artificial irritation, which we excite by revulsives, can be practised, in such cases, with perfect impunity. The irritation excited by the epispastic may, indeed, be added to that, which appertains to the disease, and if there be a disposition in the phlegmasia to change its seat, or to extend to analagous structures,—the gouty, or rheumatic irritation, in such structures, may be augmented by epispastics; but it is not easy to see, that they can have the effect, either of “fastening down” the gout on the extremities, according to the view of Professor Chapman; or that they can give occasion to metastasis, according to that of Professor Thomson. The disease itself—as well as rheumatism—is metastatic or changeable, and this, whatever may be the plan of treatment pursued, although I am not prepared to say, that such change of seat may not be promoted by certain agencies rather than by others. I have had the misfortune to witness several cases of serious pericarditis, occurring in the course of acute rheumatism, although neither blisters nor any other applications were made to the affected joints; yet I have little doubt, that had they been employed, the metastasis or the extension of the disease, would have been ascribed by Professor Thomson, and by those who think with him, to the epispastics.

But, although difference of sentiment exists regarding the effects of epispastics in acute gout, and rheumatism, practitioners are agreed on the benefits to be derived from them, where the gout is atonic, and the rheumatism chronic. They are then used by all, and, in the latter disease especially, revulsives of almost all kinds are more or less invoked;—all the varieties of epispastics are applied in some condition or other, and by some practitioner or other; whilst the urinary organs are irritated by the turpentine, whose action in such cases is altogether revellent, and, in those cases of rheumatism, or of neuralgia, to which the terms ‘lumbago’ and ‘sciatica’ have been appropriated, the excitation, produced in the urinary organs, exerts a most salutary agency,—the new impression, made there, deriving, or detracting from the neuralgic condition in the lumbar or coxal region. In some of these cases, the use of phosphorus, or of the moxa, or of the actual cautery in its ordinary form of application, has broken in upon the morbid impression when other external revulsives had failed. It is in such cases, too, that the new nervous impression made by acupuncture is so advantageous.

In consequence of the easy absorption of the cantharidine when the flies come in contact with an abraded surface, blisters have been considered improper in inflammatory conditions of the urinary organs ; but the plan, to which I have already adverted, of placing a substance between the plaster and the skin, obviates this objection, and permits counterirritation by those agents, to the same extent as if the inflammation were seated in any other organ.

The remarks, that have been made on the employment of revulsives in inflammation, are equally applicable to hemorrhages. When hyperæmia exists in any tissue, the action of a revellent detracts from that hyperæmia, whether its presence be indicated by the ordinary signs of inflammation, or by the occurrence of hemorrhage. Accordingly, the various forms of revellents are had recourse to, in these cases, with marked advantage. Emetics, and cathartics exert their efficacy in hemorrhage rather by their revellent than by their depleting or evacuant properties ; and the great general principles, that guide the practitioner in the administration of revellents in the phlegmasiæ, must guide him here. I have before remarked, that substances or agencies, belonging to this class, often act in the most salutary manner, as indirect astringents, by causing a diversion of the blood from the seat of the hemorrhage, and, that it is in this way, that the application of cold to the nape of the neck, and that charms are hæmostatics. Led by the great principles, referred to, we excite the feet, or the rectum, in apoplexy ; apply vesicants, suppurants, or rubefacients to the exterior of the thorax in hæmoptysis, endeavouring, in this manner, to establish a centre of fluxion in some part of the organism, which does not receive its blood from the same arterial trunks as are concerned in the hemorrhage. Even in cases of the less active and passive kinds of hemorrhage, we find marked advantage from the employment of revellents ; and they are, consequently, amongst the remedies most frequently used, whenever a discharge of blood from any set of vessels is kept up for a length of time ; precisely, indeed, for the same reason, that we have recourse to revellents, in prolonged morbid conditions of any internal organ.

In the hæmoptysis, which is symptomatic of phthisis, and in phthisis in general, revellents are more relied on than any other class of remedies ; and, if they fail, as almost every agency does fail, when the disease is once fixed in the pulmonary tissue, we cannot look, with any well found expectations of benefit, to any

other division of Therapeutical agents. The revulsion is here variously effected ;—sometimes, by cantharides; at others, by the tartar emetic ointment; at others, by the moxa, by issues, the seton &c., &c. The object being to establish and maintain a centre of fluxion on the exterior of the chest, a succession of blisters is well adapted to the case, or the tartar emetic ointment; but the issue or the seton, when once inserted, being easily kept up, is preferred by some physicians and patients.

With regard to the employment of revellents in affections of the nervous system, I need not say much. I have already spoken of their utility in apoplexy, when considering their use in hemorrhage. In paralysis, epispastics are often had recourse to, but never perhaps with the view of producing revulsion. They are employed altogether as excitants proper, and have, accordingly, been considered under that division of medicinal agents.

In mania, every variety of revulsive has been used. Whether the disordered intellect has arisen in the ordinary course of life, or in the puerperal state; whether it may have been hereditary or acquired, the mischief has too often been regarded as requiring exclusively physical management; and most of the agents, that have been advised, have been of a kind, adapted for repressing inordinate organic actions. That the disease is of a physical nature, or dependent upon altered condition of the organ, through which the mental and moral manifestations are elicited, is, I conceive, unquestionable; but it is not of such a character, in the majority of cases, as to be removed by those agents, that are adapted for removing a hyperæmic condition of the encephalon; and, whether these, or, indeed, any agents have to be employed, must depend upon the particular circumstances that occasioned, or are present during, the disease. As a general rule, we are constrained to confine our treatment to the influence, which we can exert on the encephalon, through the *moral*; and, by a proper application of ‘mental revulsives’—if they may be so termed—to break in upon the morbid train, constituting the insane hallucinations.

A recent writer—in a lucid and philosophic essay on the ‘Disorders of the Mind in Lying-in Woman’*—has the following remarks, which are applicable to mental alienation in general.

“Whatever may be the causes which excite these diseases,

* ‘An account of some of the most important diseases peculiar to women.’ By Robt. Gooch, M. D. Second Edit. p. 124.

the most important question still remains to be considered—what is that morbid state of organization on which the disorder of the mind depends? This is the proper object of medical art. We have no power by medicinal agents of relieving a disordered mind, excepting indirectly through the disorder of the body with which it is connected. It is impossible therefore to stir one step in the treatment of the disease without first ascertaining what this disorder is; or if different in different cases, what they are, how to discriminate them, and whether experience shows that one is more common than the other.

“There is a strong disposition, not only popular but professional, to attribute raving of the mind to inflammation of the brain. Perhaps it originates in this—that the disorder of the mind with which we are most familiar is drunkenness, which is known to be caused by spirits, and to be cured by temperance. Mania is called brain-fever, and the sight of a raving patient instantly suggests the thought of cupping-glasses, iced-caps, low diet, and purgatives. This view of mania is, when it occurs in childbed, still farther corroborated by the popular notions about lying-in-women. If a woman becomes deranged in childbed, it is said not only that she has a brain fever, but that the milk has flown to her brain, hence the term ‘mania lactea.’ Dr. Denman says, that in his time it was a prevalent notion among the people, but an obsolete one in our profession; and formerly it was usual to attempt relieving the disease by restoring the milk and the lochia. It would be as good pathology to attribute puerperal fever to a suppression of the milk, and as good practice to attempt to cure it by drawing the breasts, fomenting the pelvis, or using any other local means for restoring these secretions.

“But experience and reflection lead to very different conclusions: they teach us that the disorder of the mind may be connected with very opposite states of the circulation, sometimes with inflammation or active congestion, for which depletion is the shortest and surest remedy; sometimes with an opposite condition of the circulation, which depletion will only aggravate.

“Cerebral excitement does not necessarily depend on inflammation or congestion, nor is depletion, however moderate, necessarily the proper remedy. Cerebral excitement is often aggravated by depletion; and in some cases, as I shall have occasion to relate, absolutely brought on by it. Now the question, what is the morbid state of organization on which puerperal in-

sanity depends, must be determined in the usual way. There is only one safe mode of working the problem, by observing the causes which brought on the disease, the bodily symptoms, which accompany it, the way in which it is affected by remedies, and the morbid appearances discovered after death. These points can be learned only by an attentive and thoughtful observation of cases, and will be best communicated by the relation of them."

For the removal of most of those bodily symptoms, that are usually observed in mental alienation, much use is made of agents of the revellent kind. If there be headache; suffused eyes; flushed face, &c., general bloodletting may be demanded; but usually the combination of depletion and revulsion, afforded by cupping, is sufficient for the evil, and more beneficial, in its operation, than general bloodletting.

In furious mania, epispastics to the head, nape of the neck or to the lower extremities have been strongly advised by some; but although, as we have seen, they may occasionally break in effectually upon the abstractions, they frequently add to the excitement, by the irritation they produce; and cannot often be indicated. As a general rule, indeed, the soothing or abirritating system of management is required, and if the patient be indomitable by other agents, we have recourse to the *douche*, which rarely fails. In all insane establishments an apparatus of the kind exists. It consists of a reservoir above the ceiling of the apartment, from the bottom of which a plug can be withdrawn, so that a column of water may be made to impinge on the naked head. The powerful revulsive impression made on the nervous system, by the 'shock' from the fluid, rarely fails in taming the most furious maniac. Even the cold dash—or the spout bath—is often sufficient for the purpose; and the means are always at hand. The head of the patient may be placed over a pail of water and over the edge of the bed, and water may be poured from a watering pot, or from any vessel—the operator standing on a chair, and in this manner allowing the water to fall from a height. A professional friend has just informed me of a distressing case, in which he employed this variety of the *douche* with signal advantage, and several such cases have occurred to me. A lady, in consequence of the abrupt announcement that her son—a fine boy—was burnt to death, became frantic, and was completely unmanageable, until the 'douche' was employed, in the mode just described: she was gradually overpowered under its operation, and sank to sleep. Since the introduction of this agent, more violent means of restraint, in mania,

have been almost abandoned ; and, by analogy, the ‘cold dash’ or ‘douche’ has been employed with signal advantage in various other encephalic conditions—convulsions, poisoning by opium, delirium tremens, &c.

Where mental alienation has persisted for some time, and adequate attention has been paid to appropriate seclusion, and to preventing, as far as possible, the intrusion of any insane idea, the most salutary revulsion is occasionally operated, by that thorough change in all the physical influences surrounding the individual, which travelling affords. The new objects, which perpetually present themselves to the eye, keep the mind actively engaged, and prevent it from brooding upon any topic, which may have constituted the insane hallucination. Exercise and amusement out of doors are, indeed, amongst the most important of the agencies, adopted in the treatment of insanity, and every well constituted private or public institution for the insane is provided with means for keeping the mind engaged, and amused. Some of the private establishments, in the neighborhood of Paris, are admirably supplied in this respect. If the patient choose the more active games, of which there is an extensive choice ; or if he prefer riding, or sailing—for there is usually a considerable basin of water, in some part of the *Ferme ornée*,—or if he select the exercises of horticulture or agriculture, he is always indulged, due care being taken to discriminate, whether he is in a state to be permitted the recreation, with or without his keeper.

The whole moral system of management is, indeed, one of revulsion. It consists in keeping the mind engaged on every topic, except the one which is predominant ; or, as the phrenologists would say, in keeping every cerebral organ of the mental and moral manifestations occupied, except the one which is prominently, if not solely, diseased.

Hysteria, the seat of which I have, more than once, asserted to be in the cerebro-spinal nervous system especially, is mainly treated by revulsives, as by cupping over the sides of the vertebral column, or elsewhere ; by stimulating injections ; the cold douche ; and by nauseous ‘antispasmodics,’ as they are termed ;—all of which exert their beneficial effects through the new impression they excite in the nerves, with which they come in contact, thus detracting from the nervous concentration directed towards some other point of the nervous system, and generally, perhaps, towards some part of the cerebro-spinal axis.

In tetanus, and in hydrophobia, revulsives are rarely used, if we except the cold affusion, which, in one case of 'tetanus algidus,' or tetanus arising from cold, that fell under my observation, removed all the spasmodic symptoms by the shock it occasioned.

In convulsions, epilepsy, and chorea, epispastics are rarely employed, and never without some accidental symptom is present, which appears to indicate their use. In the two last diseases, however, the most salutary operation is occasionally exerted by a thorough change of all the physical influences surrounding the individual. The disease appears, at times, to be kept up altogether by habit, and change of air and scene will frequently break up the morbid chain better than any other agency.

In neuralgic affections of various kinds, the practitioner trusts largely to the effect of new impressions made upon the nerves. It is in this way, that tonics act, and we shall see, that such is the *modus operandi* of narcotics. It is precisely in such cases, that the use of galvanism—in its various forms of application—as well as of the mineral magnet, has been found efficacious, breaking in upon the morbid associations, by exciting impressions on nerves not implicated in the disease, and, at the same time, attracting the nervous influx and the attention to the nerves artificially excited. In like manner, cupping—both with the scarificator, and dry—is often beneficially employed as a revulsive agency.

From what I have said, regarding the efficacy of revulsives as sorbefacients—mental as well as physical—it can be understood, that in dropsies, as well as in hypertrophy of various kinds in the solid structures of the body, the different forms of revulsion may be advantageously invoked. The reader is referred to the section on 'Sorbefacients,' and to the sections on the various local stimulants, for elucidations on this point. In hydropic affections in general, blisters appear to be more indicated, where there is much local irritation, as in hydrothorax especially—which is usually a sthenic dropsy. Still, in all, they establish a centre of fluxion—a new action in the nervous and sanguiferous systems—and cases are on record, in which the discharge from the blistered surface has been so profuse as to constitute an outlet—as it were—for the fluid of the dropsy.

It is obviously impossible to point out every variety of morbid condition, in which revellents may be useful. This can easily

be inferred by one who has attended to the great general principles of management, which I have endeavoured to lay down. In other works,* I have pointed out the advantage to be derived from the revulsion, which change of air, society, and scene are capable of effecting in health; and an attentive consideration of both its hygienic and therapeutical relations and applications cannot fail to exhibit it as one of the most important of the agencies, which we employ both in prophylactic and curative medicine.

* 'Elements of Hygiene,' p. 149, and article 'Atmosphere,' in Hays's American Encyclopedia of practical medicine.

TABLE

OF THE CHIEF REVELLENTS, AND THEIR FORMS OF PREPARATION.

A. Every physical and moral agent capable of modifying the function of innervation; and, therefore, all classes of therapeutical agents hitherto considered, and most of those that have to come.

B. EPISPASTICS.

A. RUBEFACIENTS.

AGENT.	FORM OF PREPARATION.	HOW USED.
<p>Acidum Aceticum. <i>Strong Acetic Acid.</i> (Made by distilling from a mixture of acetate of soda and sulphuric acid.)</p>	.....	{ Diluted with an equal quantity of water.
<p>Acidum Nitricum. <i>Nitric Acid.</i></p>	.....	{ Properly diluted with water, or mixed with 6 or 8 parts of lard.
<p>Acidum Sulphuricum. <i>Sulphuric Acid.</i> (See Table of Tonics.)</p>	.....
<p>Allium Sativum. <i>Garlic.</i> (The Bulb.)</p>	.....	{ Bruised and applied as a cataplastm; or steeped in spirits.—Also, the juice mixed with oil.
<p>Ammonia. <i>Ammonia.</i> (See Table of Excitants.)</p>	<p>Linimentum Ammonia. <i>Volatile Liniment.</i> (Aq. ammon. f. oz. $\frac{1}{4}$; ol. oliv. f. oz. 2.)</p>	
<p>Ammoniacum. <i>Ammoniac.</i> (See Tables of Expectorants and Sorbefacients.)</p>	<p>Emplastrum Ammoniaci. (See Table of Sorbefacients.)</p> <p>Emplastrum Ammoniaci cum Hydrargyro. (See Table of Sorbefacients.)</p>	
<p>Assafœtida. <i>Assafetida.</i> (See Table of Antispasmodics.)</p>	<p>Emplastrum Assafœtidæ. (Assafœtid.; empl. plumbi ana lb. 1; galban.; ceræ flavæ ana lb. $\frac{1}{4}$.)</p>	
<p>Capsicum. <i>Cayenne Pepper.</i> (See Table of Excitants.)</p>	.....	{ In the form of cataplastm, or as a lotion, mixed with heated spirits.
<p>Galbanum. <i>Galbanum.</i> (See Tables of Antispasmodics and Sorbefacients.)</p>		

AGENT.	FORM OF PREPARATION.	HOW USED.
	Emplastrum Galbani compositum. (See Table of Sorbefacients.)	
Olea Essentialia. (Ol. cajuputi; ol. terebinthinæ, &c.) Essential Oils. (Oils of <i>Cajuput</i> , <i>Turpentine</i> , &c.)	{ }	{ Mixed with oil,—with or without the addition of the Aqua Ammonizæ.
Pix Abietis. <i>Burgundy Pitch</i> . }		
	Emp. Picis cum Cantharide. <i>Warm Plaster</i> . (Picis abietis lb. 3½; cerat. cantha- rid. lb. ½.)	{ In the form of plaster, gener- ally spread upon leather.
Sinapis. <i>Mustard</i> . (See Table of Excitants.) }	{ }	{ Formed into a cataplasm, with the addition of flour, by means of water.
Caloric. (See Table of Excitants.)		
Friction.		

B. VESICANTS.

Ammonia. <i>Ammonia</i> .	Aqua Ammonizæ. (See Table of Excitants.)	{ A piece of linen or bibulous paper wet with it applied to the part.
Argenti Nitras. <i>Lunar Caustic</i> . (See Table of Tonics.) }	{ }	{ By moistening the part vesi- cated, and then drawing a picce of the nitrate over it in a crucial direction.
Cantharis. <i>Spanish Fly</i> . Cantharis vittata. <i>Potato Fly</i> . (See Table of Diuretics.)		
	Ceratum Cantharidis. Emplastrum Cantharidis. <i>Blistering Plaster</i> . (Cantharid. in pulv. lb. 1; ceræ fla- væ; resinæ, ol. oliv. ana oz. 8. Melt and then add the flies.)	{ Spread on leather, soft lin- en, or paper.
	Linimentum Cantharidis. (Cantharid. in pulv. oz. 1; ol. tereb. O ½; digest and strain.)	
	Tinctura Cantharidis. (See Table of Diuretics.)	{ If too powerful, it may be reduced by the addition of olive or linseed oil. { When reduced by the addi- tion of soap liniment, &c., it is rubefacient.

AGENT.	FORM OF PREPARATION.	HOW USED.
Hydrargyri Deuto-Ioduretum. <i>Deuto-Ioduret of Mercury.</i> (See Table of Sorbefacients.)	}	{ Moistened and applied to the part to be vesicated.
Ranunculus. <i>Crow'sfoot.</i> <i>Buttercup.</i> } .....	.....	{ The bruised leaves applied to the skin.
Sinapis. <i>Mustard.</i> (See above, under Rubefacients.)	}	{ Mixed with water or vinegar into a cataplasm.
Caloric.	{ Steam. Boiling water. }	{ The surface surrounding the part to be vesicated to be protected.
	{ Heated metal.	{ By heating a piece of polished metal in boiling water, and applying it to the part.

C. SUPPURANTS.

Acida Mineralia. <i>Mineral Acids.</i>	{ Combined with a greater quantity of lard, than mentioned under the head of Rubefacients.	{ Rubbed on a part, they in due time occasion the formation of pustules.
Antimonii et Potassæ Tartaras. <i>Tartar Emetic.</i> (See the Table of Emetics.)	Unguentum Antimonii tartarizati. (Antim. tart. et potassæ. dr. 1 veldr. 2.; adipis, dr. 7.)	A piece the size of a hazel nut to be rubbed on night and morning, or it may be applied spread on linen. The tartrate of antimony and potassa is also sprinkled on adhesive or lead plaster, or on basilicon or simple cerate: it is used, also, in a saturated aqueous solution.
Cantharis. <i>Spanish Fly.</i> (See above, under Vesicants.)	Unguentum Cantharidis. (Pulv. cantharid. oz. 2; aq. distill. O ½. cerat. resin. oz. 8. Boil the water, with the flies, to one half; strain, mix the cerate and evaporate.)	{ Spread on lint to keep blisters or issues open.
Mezereum. <i>Mezereon.</i> (The bark of the root.) (See Table of Diaphoretics.)	.....	{ A small piece, soaked in vinegar, and applied to the skin, causes vesication and ulceration.—An ointment is sometimes made of the expressed juice.

AGENT.	FORM OF PREPARATION.	HOW USED.
Pix Abietis. <i>Burgundy Pitch.</i> (See above under Rubefacients.)	The simple Burgundy pitch plaster; as well as the emplastrum picis cum cantharide.	{ Both one and the other sometimes occasion pustulation.
Sabina. <i>Savine.</i> —(The leaves.) (See Table of Emmenagogue.)		
Tiglli Oleum. <i>Croton Oil.</i> (See Table of Cathartics.)	Ceratum Sabinæ. (Pulv. sabinæ oz. 2; cerat. resinæ lb. 1.)	{ As a dressing to blistered surfaces, to produce suppuration.
	.....	{ To produce pustulation, diluted with two or three parts of olive oil, camphor or soap liniment.
Fonticulus. <i>An Issue.</i>	{ Made either by cauterants—(See Table of Escharotics)—or by cutting instruments.	{ Kept open by means of a peg or some suppurant agent.
Setaceum. <i>A Seton.</i>	{ A long strip of fine linen or cotton twist, passed through the cellular membrane beneath the skin, by means of the seton needle.	{ A fresh portion of the thread is drawn through the sore every day.

D. ESCHAROTICS.

1. *Erodents.*

Acidum Aceticum. <i>Acetic Acid.</i> (See above under Rubefacients.)	{ }	{ In a dilute state in cases of warts and corns.
Acida Mineralia. <i>Mineral Acids.</i> (Muriatic, Nitric, and Sulphuric.)		
Alumen exsiccatum. <i>Dried Alum.</i>	{ Alum from which the water of crystallization has been driven by heat.	{ In cases of fungous granulations; sprinkled, in powder, on the part. Also, an excitant to indolent ulcers.
Argenti Nitras. <i>Lunar Caustic.</i> (See above under Vesicants and Suppurants.)	{ }	{ Applied in the solid state to fungous growths, warts, corns, &c., the part being first slightly moistened. Also, in solution, from 40 to 60 grains to the ounce.
Cupri Acetas. <i>Acetate of Copper.</i> <i>Verdigris.</i> (See Table of Tonics.)	{ }	{ In the form of powder to warts, fungous growths &c.

AGENT.	FORM OF PREPARATION.	HOW USED.
Cupri Sulphas. Sulphate of Copper. Blue Stone. (See Table of Tonics.)	Linimentum Æruginis. Oxymel Cupri Subacetatis. Mel Egyptiacum. Liniment of Verdigris. Oxymel of Subacetate of Copper. (Cupri. acet. in pulv. oz. 1; aceti oz. 7; mel Æspum. oz. 14. Dissolve the verdigris in the vinegar; strain, add the honey, and boil to a proper consistence.)	Undiluted, or mixed with some mild ointment, to destroy fungous granulations. —An excitant to indolent ulcers.
	Unguentum Cupri Acetatis. Cupri acetat. ppt. in pulv. oz. 1. Ung. simpl. oz. 15.)	Fungous granulations may be touched by it in substance; or the powder may be sprinkled on them, or rubbed on warts, &c. A strong solution may likewise be used.
	Sabina. Savine. (The leaves.) (See above under Suppurants.)	In the state of powder or infusion to warts. The expressed juice used in the same cases.
Saccharum purissimum. Refined Sugar.		Sprinkled upon spongy irregular granulations. Acts as a sorbafacient as well as in specks of the cornea, &c.

2. Actual Cauterants.

Caloric.	White Hot Iron. Moxa. (In China, from the down of the <i>Artemisia sinensis</i> . Usually formed by making a cylinder of cotton wool, enveloped in cotton cloth,—the cotton-wool being soaked or not in nitre; or in a solution of chlorate of potassa; also made of the pith of the <i>Helianthus annuus</i> , enveloped in cotton.)	Protect the surrounding parts with layers of damp thick paper, having a hole large enough for the cautery. Placed near the part, or drawn along at a slight distance from it. According to the duration of the application, and intensity of the combustion, it may excite rubefaction, or vesication. To produce an eschar, it must burn down on the part. The combustion can be hastened by the blow-pipe.
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AGENT.	FORM OF PREPARATION.	HOW USED.
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3. Potential Cauterants.

Acidum Arseniosum. <i>Arsenious Acid.</i> (See Table of Tonics.)	{ One part of the arsenious acid to five parts of the flowers of sulphur, made into a paste, with gum water, or saliva. Only used in cancerous and ill-conditioned sores.
Acidum Nitricum. <i>Nitric Acid.</i> (See Table of Tonics.)	.....	{ Not used to form an issue. As an escharotic, to sloughing phagedenic sores, by means of sponge; the surrounding parts being protected by some ointment or by lard. Diluted with water, it is an excitant to indolent ulcers.
Acidum Sulphuricum. <i>Sulphuric Acid.</i> (See Table of Tonics.)	.....	{ In the same manner, and circumstances as Nitric Acid.
Antimonii Murias. <i>Muriate of Antimony.</i> <i>Butter of Antimony.</i>	{ Most effectually and rapidly by the combination of metallic antimony and chlorine.	{ In consequence of its deliquescent character not often employed.
Argenti Nitras. <i>Nitrate of Silver.</i> <i>Lunar Caustic.</i> (See Table of Tonics, and above.)	.....	{ One drachm dissolved in an ounce of water, to foul ulcers. Rubbed on the part to form an issue.
Calx. <i>Lime.</i> <i>Quicklime.</i> (The hydrate of the oxide of calcium.)	.....	{ As an escharotic,—restricted to the surface to be acted upon—Not often employed.
Potassa. Potassa fusa. Lapis causticus. Causticum commune. Potassa. <i>Stronger common Caustic.</i>	{ By evaporating the solution of potassa, until ebullition ceases and the potassa melts; then running into proper moulds.	{ To form an issue by putting adhesive plaster with a hole in it on the surface, and then rubbing the skin with the potassa moistened at one end. A solution of dr. 1½ in f. oz. 2 of distilled water, applied by means of a sponge, is rubefacient.
Potassa cum Calce. Causticum commune mitius. <i>Potassa with lime.</i> <i>Milder common Caustic.</i>	{ From Sol. potassæ, O iij; calcis lb. 1; Boil to lb. 1; add the lime slaked, and mix.	{ To form issues. Less deliquescent than the potassa.

SECTION XV.

ANTISPASMODICS.*

Definition of antispasmodics—Spasm considered—No direct antispasmodic—Modus operandi of the indirect mental antispasmodics—Therapeutical application of antispasmodics, in tetanus, chorea, epilepsy, asthma, hooping cough, colic, hysteria, &c.

PERHAPS with propriety the class of antispasmodics might be included under that of revellents, their whole effect being operated by revulsion. Such, however, is not the universal belief, and indeed great discrepancy has existed among therapeutical writers as to the precise situation, in which they ought to be placed. Murray classes them, with narcotics, amongst the “diffusible stimulants;” whilst Thomson places them with these same agents,—as substances that diminish action secondarily. A short inquiry may tend to place them in their proper position.

Antispasmodics are usually defined, “substances that allay irregular muscular contraction,” and Paris† affirms, that there are certain medicinal bodies, which would appear to exert a specific control over spasmodic action, from whatever cause it may have originated: such, he says, are assafœtida, galbanum, musk, castor, ammonia, valerian, &c. He properly adds, however, that “in a more general view of the subject, we must admit, that this class branches, by indefinable gradation, into narcotics and tonics; for since spasm may be connected with the most opposite states of the body, it is very evident, that many of the individuals included in the class of antispasmodics, can only be relative agents: spasm, for instance, may arise from excessive irritability, as from teething, wounds, worms, &c., in which case a narcotic would prove beneficial; or it may depend upon a state of general debility, the proper remedy for which would be the administration of an aromatic stimulant, or the assiduous exhibition of some permanent tonic.”

I do not think, however, that I am too sceptical in denying, that, in the present state of our knowledge, we are acquainted

* From *avri*, ‘against,’ and *σπασμοι*, ‘spasm.’

† Op. citat. p. 78.

with a single remedial agent, which acts specifically on the muscular fibre when in a state of spasmodic contraction. That such agents *may* exist cannot be denied, but we know, at this time, none such. They may all be regarded as *indirect* agents; relieving and removing spasmodic action, in consequence of their agency being exerted on other parts of the nervous system than those concerned in the irregular muscular contraction, and thus deriving from the nervous influence concerned in the production of the latter.

In order to thoroughly comprehend this position, let us inquire into the nature of spasm. The Greeks gave the name to every kind of convulsion; and, by modern nosologists, convulsions are ranked amongst the 'spasmi'. The term is now usually applied to involuntary contractions, especially of the voluntary muscles; and these, again, have been divided into 'tonic' spasms, which consist in permanent rigidity of the muscles concerned,—of which we have an example in common cramp;—and into 'clonic' spasms, which consist in alternate contractions and relaxations—of which we have an example in the convulsions of children.

It is now admitted by most physiologists, that the muscular fibre, like every primary tissue of the body, is possessed of excitability or irritability,—that is, of a power of being acted upon by appropriate stimuli, and of moving responsive to such stimuli. This *vis insita*, however, absolutely requires, that it shall be acted upon by stimuli before motion is perceptible. Now, the muscular filaments of the voluntary muscles are supplied with nerves from some part of the cerebro-spinal axis, and along these nerves the appropriate stimulus is sent which rouses them to contraction. In the case of voluntary motion—say, of the biceps of the arm to raise any weight attached to the hand, or to the extremity of the forearm—an act of volition is executed, under the influence of which the portion of the cerebro-spinal axis, whence the nerves proceed to the upper extremity, is excited to send the proper nervous influx along those nerves, in quantities strictly in accordance with the extent of action, which the muscle should execute. The muscle immediately contracts responsive to the stimulation. Now, if any cause of irritation exist in the cerebro-spinal axis, or indeed in any part of a nerve distributed to a muscle such irritation may induce precisely the same effect as the act of volition, and the muscle may, in this manner, be permanently or intermittently contracted. In all cases, therefore, spasm is a nervous phenomenon, and the remedies, that are adapted for its

removal, must exert their agency on some part of the nervous system,—not on the muscular fibres, over the condition of which they would not appear to have the slightest control.

They, who admit ‘direct’ antispasmodics, find, that difficulties environ the γ , the very nature of which entangles the subject in inextricable meshes. One of the latest writers on Therapeutics,*—after entering into a long and singularly infelicitous disquisition on the precise agency of antispasmodics,—suggests, as a point requiring consideration,—whether antispasmodics are stimulants or sedatives? and he decides, that they are sedatives; “for,” he remarks, “if the irregular or inordinate action, which they overcome, be the consequence of irritation, either mental or corporeal, it follows that, in resolving spasm, the susceptibility of impression in the extreme motor nerves must be diminished; and this can only be the result of a sedative power. It may, however, be affirmed, that this must either be immediate or consecutive of a previous stimulant operation; thence we can explain the reason, why some of those medicines, which can only be regarded as direct antispasmodics, stimulate the general system, and, consequently, quicken the pulse; since, like narcotics, this action may be primarily of a stimulant character, and be quickly followed by collapse. According to this mode of reasoning, the same results may follow from antispasmodics operating exclusively on the motor nerves, as from narcotics operating on those of sensation.”

Without tarrying to animadvert on many of the hypothetical positions contained in this extract as to the *modus operandi* of antispasmodics, and the parts on which they specially act, I may observe, that every difficulty vanishes when we regard the ‘direct’—for such only can be esteemed ‘true’—antispasmodics, as revellents only; acting by virtue of the new impression they make on the gustatory or gastric nerves, and thus deriving from the inordinate action going on in some other portion of the nervous system. What, indeed, are the reputed direct antispasmodics?—musk,—castor,—Dippel’s oil,—oil of amber,—valerian,—assa-fœtida,—galbanum,—bitumens,—skunk-cabbage,—ethers, &c.;—all substances belonging to the class of excitants, and many of them calculated, in addition, to make a powerful impression on the nerves of gustation and olfaction: and what, again, are the ‘indirect’ antispasmodics? Dr. Thomson divides them into ‘material,’ including tonics and narcotics; and ‘mental,’ comprising,

* Thomson, op. citat. p. 606.

fear and abstraction. It is strange, however, that he should not have classed bloodletting amongst the material agents, especially as he had previously remarked, with much propriety, that, whether the effects of antispasmodics are perceptible very soon after their administration must necessarily depend on the cause of the spasm, "whether it arise from exhaustion and collapse; such, for example, as occurs from bloodletting, when the quantity of the vital fluid abstracted is more than the condition of the system can support, in which case nothing is more common than for syncope to be attended with convulsions; or whether it depend on the opposite state, fulness of the vessels of the brain, sufficient to produce epilepsy, or on some degree of inflammation, as in phrenitis, which is sometimes also attended with convulsions." "It should ever be remembered," he adds, "that although antispasmodics are indicated, and proper in the first state, just described, yet, that this class of medicines is positively injurious, when the spasmodic action is the consequence of inflammation of the brain or spinal marrow, or their coverings: under such circumstances, bloodletting and measures calculated to subdue the primary disease are the means to be adopted."

One of the great difficulties, indeed, in discriminating the character of different diseases of the convulsive kind, is involved in the consideration, whether they are dependent upon an inflammatory or congestive condition of vessels, or whether they may not be connected with exhaustion, or excessive irritability of the nervous system. In another section I shall dwell on every thing applicable to this portion of the subject, when considering the effects of the abstraction of blood in such diseases. To that section I must refer the reader.

In ordinary cases of spasmodic action, not dependent upon any excited action of vessels, any thing that produces a new nervous impression will prove antispasmodic. Narcotics do so by allaying the impressibility of the whole nervous system. Nauseous agents produce their effects upon the olfactory or gustatory nerves, and if they be excitants at the same time, upon the nerves of the stomach. Simple excitants and tonics act on the same nerves, and through them on the general system. Nothing, indeed, could better elucidate the *modus operandi* of these agents, than those, which Dr. Thomson has termed mental narcotics — *Fear* and *Abstraction*. He refers to a striking instance of the sanative effect of fear in whooping cough kept up by habit. The patient, a young boy, was threatened with the application of a large blister, and although it was not applied, but merely placed within his view, the dread of it completely relieved the cough.

Boerhaave is asserted to have cured Epilepsy, by taking a red hot poker, at the moment of the expected attack, and threatening to push it down the throat if the patient should have a fit. Still more recently, the same remedy has been advised to be directed towards the nether extremity of the body. In a treatise on plague, dysentery, and ophthalmia, Dr. Louis Frank recommends that a dysenteric patient should be tied hand and foot, and be held by two men, when—"chirurgus cum ferro candenti, figuram conii habenti, coram ægroto compareret, et id versus anum dirigeret, quasi id ano intrudere vellet."*

All these are cases of the simple revulsive effect of fear, and in this way any mental emotion may prove antispasmodic. Any form of abstraction, or rather of distraction, is necessarily revellent, and antispasmodic. When Cato, the Censor, reduced luxations, as he pretended, by certain mystic words, he diverted the attention of the sufferer, prevented inordinate contraction of the muscles around the dislocated joint, and a slight manipulation only was necessary to reduce it. At the present day, the surgeon is in the habit of invoking this agency, and although he may have no faith in set forms of speech, or in cabalistic expressions, he knows, that if he can concentrate the attention of the patient, he may lessen the contraction of the muscles, by diverting, in some measure, the nervous influx from them; and if he suddenly exerts his skill at reduction, when the mind is occupied with other matters than the accident, the bone can occasionally be made to slip readily into its place.†

By a precisely analagous agency, the Animal Magnetizer operates his cures, and change of air, society, and scenery exert their good effects in nervous maladies. It is not long since I visited a gentleman who had suffered for some hours under such excruciating pains in the bowels as to induce him to believe that he was labouring under enteritis. As soon as I had examined into

* *De Peste, Dysentericæ et Ophthalmia Ægyptiaca.* Auctore Ludovico Frank, M. D., pp. 223. 8vo. Viennæ, 1822.

† In the "Table Talk," of Coleridge, there is an allusion to a popular charm for cramp, which probably is not novel to many of my readers. "When I was a little boy at the Blue-coat School, there was a charm for one's foot when asleep; and I believe it had been in the school since its foundation in the time of Edward the Sixth. The march of intellect has probably now exploded it. It ran thus:—

Foot! foot! foot! is fast asleep!
Thumb! thumb! thumb! in spittle we steep;
Crosses three we make to ease us,
Two for the thieves, and one for Christ Jesus.

And the same charm served for a cramp in the leg, with the following substitution:—

The devil is tying a knot in my leg!
Mark, Luke and John, unloose it, I beg!
Crosses three," &c.

"Table Talk," ii. 33.—American Edit.

his case, and laughed at his fears, under the new mental condition induced the colicky spasms rapidly yielded, and in half an hour I left him well. Some of the highly nervous—the imaginative—can feel pains wherever they please, and many an individual, by the perusal of cases of disease, has fancied himself affected with the same sufferings which he has seen described. If, therefore, *attention* can direct the nervous afflux to a part, it is obviously of great moment so to impress the nervous system of the individual, that no concentration of the kind shall take place in the suffering organ, and this can be accomplished by engaging the mind upon some subject of entertainment or reflection, by impressing the totality of the nervous system, or, by affecting nerves at a distance from those implicated.

I have before observed, that I do not regard the direct or true antispasmodics, as they have been termed, as worthy of the name—and that I esteem them to produce their effect by the impression they make on the nerves of two of the senses, and by their stimulant properties, which,—in the case of the articles referred to, as ‘true antispasmodics,’—are dependent upon animal resin, empyreumatic oil, volatile oil, gum resin, or bitumen. It has been affirmed, however, that this view is negatived by the fact, that assafoetida—and the remark applies to other articles on the list—relieves hysteria, even when injected into the rectum, and when, of course, there can be no impression made on either the gustatory or olfactory nerves. This is true; but the whole effect appears to be produced by the excitant properties of the gum-resin, and that this is the case is demonstrated by the fact, that if we throw up an excitant—which may never have been regarded as an antispasmodic—we produce the like result. By either agent we make a new impression on the nerves of the rectum, and this derives from the morbid condition seated elsewhere in the nervous system, and, at times, rouses the individual to consciousness. In such cases, I am in the habit of administering an enema of the oil of turpentine, not, however, because I regard it as possessing any virtues over the excitant oils in general. I do not look upon it as entitled in any respect to the appellation of a ‘direct’ or ‘true’ antispasmodic.

To exhibit what little confidence is reposed in the ‘true antispasmodics,’ by practitioners in general—even by those who consider that such a class really exists—let us briefly inquire into the different antispasmodics—‘direct’ and ‘indirect’—that are employed in affections of the nervous system, which are regarded by all as eminently adapted for them;—an inquiry which

will signally exhibit how much more the latter class are relied on, when much disease is present, than the former. There is, indeed, but one morbid condition, in which the 'direct antispasmodics' are largely employed at the present day, and the rationale of their action in it is sufficiently manifest.

Tetanus affords us an example of a tonic spasm, which would seem to be signally adapted to test the efficacy of 'direct antispasmodics.' The disease is seated in the great nervous centres, and unfortunately is too often totally irremediable. Rarely, however, do we find musk, or assafoetida, or castor, or any of the 'direct' antispasmodics employed, because experience has exhibited their insufficiency. Trust is reposed almost wholly on the 'indirect' agents, and especially on narcotics, of which opium is usually chosen; and it is astonishing what quantities will be borne without the induction of any signs of narcosis. Cases are on record in which 15 or 20 grains have been given every three hours for several days in succession, and yet but little effect has been produced on the disease or the patient. Under the excessive erethism of the nervous centres, which constitutes the pathology of tetanus, narcotics do not produce their ordinary results, and the same remark applies to cases of great exaltation in the action of the nervous centres, which characterizes many of the diseases belonging to the class 'neuroses.'

A case of tetanus algidus—or tetanus from cold—which fell under my care some time ago—and to which I alluded under the last section—may serve to illustrate the mode in which antispasmodics exert their agency. A young man, whilst heated, threw himself into a river to bathe. He immediately experienced some indisposition, and, in a few hours afterwards was attacked with tetanus in the form of opisthotonos. He was put upon the use of narcotics, but without the disease yielding. He was now taken out of bed, placed in a brook that ran by the house, and pailful after pailful of cold water was thrown over him, whenever the spasms became violent. Soon after the adoption of this treatment the spasms yielded, and, by a continuance of it, they ultimately passed away. The boy wholly recovered.

Now, this remedy probably exerted its agency in the manner I have described as applicable to antispasmodics in general. It made a new impression on the nervous system, by the shock that accompanied the affusion, and in this way broke in upon the chain of morbid phenomena seated in the great cerebrospinal system.

Chorea is another disease in which the true antispasmodics might seem to be indicated, yet they are but rarely employed in it. The disease appears to depend usually upon great mobility of the nervous system,—chiefly of the part connected with the nerves distributed to the voluntary muscles,—united with diminished impressibility of the nerves of the ganglionic class: hence tonics and purgatives are chiefly relied on, and they become ‘indirect antispasmodics.’

Epilepsy is dependent upon so many causes, that its treatment has to be varied according to circumstances. In the majority of cases, however, as in every disease characterized by periodicity, a powerful impression made upon the nervous system will prevent a paroxysm; but the impression must be made immediately before it is expected. Except for the purpose of preventing a paroxysm, true antispasmodics cannot in any respect be relied on; but if a large dose of assafoetida, castor, or musk were administered immediately before the hour at which a fit of epilepsy or of ague were expected, it might prevent it. It is in such cases that the mental antispasmodics have been mainly employed. Any agent, indeed, that excites a new and powerful impression—any revellent—may be followed by the same results. Most commonly, epilepsy is attended by evidences of great impressibility and debility of the nervous system; and tonics—especially the metallic tonics—are chiefly relied on. It is probably altogether by exciting a new condition in the part to which it is applied, and by modifying the circulation and innervation that a ligature, put around one of the extremities, will at times arrest a paroxysm of this disease.

Asthma, again, as I have elsewhere remarked, must be looked upon as a nervous disease—spasmodic in its character generally, that is, dependent upon an excited state of the branches of the pneumogastric nerves distributed to the bronchial tubes,—but sometimes owing apparently to something like paralysis of the same nervous branches. Hence different agents are effectual, according to the precise pathological condition. Commonly, however, narcotics are most signally beneficial. Opium is given in large doses;—stramonium is smoked;—the lobelia inflata is freely administered; galvanism is invoked; and all these are occasionally eminently successful; but we rarely hear of the administration of the ‘direct’ antispasmodics, although from the suddenness of the attacks of this disease they might seem to be indicated, and might occasionally be useful. They are so

completely eclipsed by the 'indirect' antispasmodics just mentioned, that they are very rarely employed.

Hooping cough, although a peculiar disease, is somewhat analagous in its pathology to the last. It is mainly seated in the pneumogastric nerves. When Nasse bruised and pinched one of those nerves in a living animal, so as to break down the structure of the nerve, he found that convulsive cough was excited, like that of hooping cough. But, although this disease is so markedly convulsive as to have received the name 'bex convulsiva,' and various others, indicative of its character, none but 'indirect antispasmodics' have received the confidence of the practitioner. Narcotics generally have been employed, and of these the belladonna more frequently than any other; but scarcely ever, assafœtida, musk, castor, or any of the 'direct' agents belonging to the class we are considering.

In common colic, both the "direct" and "indirect antispasmodics" may be at times advantageously used; and the same may be said of some forms of gastrodynia. When these are dependent upon causes, which gentle excitants are capable of obviating, a stimulating gum resin—like assafœtida—may be employed with prospects of benefit. Hence it is serviceable in flatulencies, for the removal of which it is often had recourse to, in popular practice.

It is only in hysteria that direct antispasmodics are, at this day, much used. The affection is cerebro-spinal, and the symptoms that indicate it are most numerous and varied. There is scarcely a nerve, indeed, or a ramification however small, which does not occasionally seem to participate in the morbid condition. Generally, the nervous erethism is chiefly concentrated in the cerebro-spinal axis, whence irradiations proceed to every part of the economy; and the object, which the practitioner has in view, is to divert the nervous action to some other portion of the frame. Hence he administers substances that are as nauseous as possible, combined or not with excitants as he may think proper. With this view he prescribes assafœtida, valerian, the dracontium, the spiritus ammoniæ succinatus, and all the reputed 'direct antispasmodics,' during the paroxysm; and in the interval adapts his remedial agents to the indications which may suggest themselves.

These few observations on the use of antispasmodics, in diseases in which they would appear to be signally appropriate, will exhibit the little reliance that can be placed upon such as are esteemed 'direct' agents—the antispasmodica vera; and I do

not think I can better terminate the few remarks I have considered it necessary to make upon this class, than by quoting the conclusion at which a therapeutical writer, already referred to, has arrived, after having occupied several pages of his work in the explanation of the *modus operandi* of the direct antispasmodics.

“From what has been said, it is evident that the range of this class of medicines (antispasmodics) is extremely limited; and, in fact, that every thing which the substances placed in it can effect, even as direct antispasmodics, may be accomplished by other orders of medicines—purgatives, diaphoretics, narcotics, and tonics. At best, antispasmodics can be regarded only as auxiliaries; and the spasm and convulsions are less to be considered than the causes which induce them: remove the cause, and the effect will cease.”*

* Thomson, *op. cit.* i. 623.

TABLE

OF THE CHIEF REPUTED ANTISPASMODICS, AND THEIR OFFICIAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Æther Sulphuricus. <i>Sulphuric Ether.</i>	{ See Table of Excit- ants.	{ Sp. Ætheris Sulphurici. (See Table of Excitants.) } Sp. Ætheris Sulphurici compositus. <i>Hoffman's Anodyne Liquor.</i> (See Table of Excitants.) }	{ f. dr. 1 to dr. 2. f. dr. 1 to f. dr. 3. f. dr. 1 to f. dr. 3.
Assafœtida. <i>Assafetida.</i> (The concrete juice of the root of the <i>Ferula assafoetida.</i>) A gum-resin.	{ From Persia.....	..... Mistura Assafœtidæ. Lac Assafœtidæ. <i>Milk of Assafetida.</i> (Assafœtid. dr. 2; aq. O $\frac{1}{2}$.) } Pilulæ Assafœtidæ. (Assafœtid. oz. $1\frac{1}{2}$; sapon. oz. $\frac{1}{2}$. aq. q. s.—divide in pil. 240.) } Spiritus Ammoniaë Fœtidus. Tinctura assafœtidæ ammoniata. Sp. ammon. O ij; assafœtid. oz. 2. Macerate, and distil O $1\frac{1}{2}$.) } Tinctura Assafœtidæ. (Assafœtid. oz. 4; alcohol. O ij.) } ..	gr. 5 to 30. f. oz. $\frac{1}{2}$ to f. oz. $1\frac{1}{2}$. No. 2 to 5. f. dr. $\frac{1}{2}$ to f. dr. 1. f. dr. 1.
Castoreum. <i>Castor.</i> (A peculiar secretion from the <i>Castor fiber</i> or Beaver;—found in sacs near the rectum.)	{ From the northern and northwestern parts of America, and from the Rus- sian dominions.	{ Tinctura Castorei. (Castor. oz. 2; alcohol O ij.) } Tinctura Castorei composita. (Castor. oz. 1; assafœtid. oz. $\frac{1}{2}$; } alcohol. ammoniat. O j.	gr. 10 to 20. f. dr. $\frac{1}{2}$ to f. dr. 2. f. dr. $\frac{1}{2}$ to f. dr. 2.
Dracontium. Ictodes fœtidus. Symplocarpus fœti- da. Pothos fœtida. <i>Skunk Cabbage.</i> <i>Swamp Cabbage.</i> (The Root.)	{	{ (A strong infusion and a syrup are used in popular practice.) }	{ gr. 10 to 20.
Galbanum. <i>Galbanum.</i> (The concrete juice of the <i>Bubon galbanum</i> , of Africa, and Syria.) A gum-resin.	{ From the Levant...	.....	gr. 10 to 20.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
<p>Moschus. <i>Musk.</i> (A peculiar concrete substance, contained in a sac, in the male <i>Moschus moschiferus</i>, situated between the umbilicus and the prepuce.)</p>	<p>From China, India, and Russia:—the best from China.</p>	<p><i>Pilulæ Galbani compositæ.</i> <i>Pilulæ Assafœtidæ compositæ.</i> <i>Gum Pill.</i> (Galban. oz. 1; myrrh; sagapen. ana oz. 1½; assafœtid. oz. ½. syrup. q. s.)</p>	<p>} gr. 10 to 10.</p>
		<p><i>Tinctura galbani.</i> (Galb. oz. 2; alcohol. dilut. O ij.)</p>	<p>} f. dr. 1 to f. dr. 3.</p>
		<p><i>Tinctura Moschi.</i> <i>Tincture of Musk.</i> (Mosch. dr. 2; alcohol O j.)</p>	<p>} f. dr. 1 to f. dr. 3.</p>
<p>Olea Essentialia. <i>Essential Oils.</i> (Especially the ol. <i>Cajuputi</i>,—the oil of the <i>Melaleuca cajuputi</i>,—and the oleum <i>Terebinthinæ</i>)</p>			
<p>Oleum animale Dip- peli. (<i>Animal oil of Dip- pel.</i>) (See Table of Anthel- mintics.)</p>			m 5 to 20.
<p>Petroleum. <i>Barbadoes Tar.</i> <i>Seneca Oil.</i> (The last term is given to that, which is procured from the Seneca Lake.) A Bitumen.</p>	<p>From the Duchy of Parma; from Galian, in France; from the shores of the Caspian; from Ava; from the West Indies; from Kenhawa, in Virg.; Scotsville, in Ken.; from western Pennsylvania; from Duck Creek, in Ohio; and from the shores of the Seneca Lake, in N. York.</p>		m 10 to 30.
<p>Sagapenum. <i>Sagapenum.</i> (A gum-resin, supposed to be the concrete juice of a <i>Ferula</i>, the <i>Ferula Persica</i>.)</p>	<p>From the Levant.</p>	<p>(The Petroleum is most commonly used externally, as a stimulating embrocation. The <i>British Oil</i> is said to consist of petrol. 1 p. by weight; ol. terebreth 2 p.; and ol. rorisamarin ½ p.)</p>	gr. 10 to 30.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE
Spiritus Ætheris Nitrici. <i>Spirit of Nitric Ether.</i> <i>Sweet Spirit of Nitre.</i> (See Table of Diaphoretics.)	From the Baltic.	.....	f.dr. $\frac{1}{2}$ to f.dr. 2
Succinum. <i>Amber.</i> (A fossil resin, found in alluvial deposits in many places.)		Oleum Succini. } (The distilled oil.) }	m 5 to 16.
Valeriana. <i>Valerian.</i> (The root of the <i>Valeriana Sylvestris</i> .)		Sp. Ammonia Succinatus. } <i>Eau de Lucc.</i> } (See Table of Excitants.)	m 10 to 30.
	From Europe.	Infusum Valerianæ. (Valerian. oz. $\frac{1}{2}$; aq. bullient. O j.)	f. oz. $1\frac{1}{2}$ to f. oz. 3.
		Tinctura Valerianæ. (Valerian. contus. oz. 4; alcohol. dilut. O ij.)	f. dr. 1. to f. dr. 3.
		Tinctura Valerianæ Ammoniata. (Valerian. contus. oz. 4; alcohol. ammoniat. arom. O ij.)	f. dr. 1 to f. dr. 2.
Mental Antispasmodics. (Abstraction,—powerful emotions,—fear, &c.			

CHAPTER V.

SEDATIVES.

General observations—Subdivision of sedatives.

ACCORDING to the classification which I have adopted, all vital therapeutical agents are ranged under one of two divisions—‘excitants,’ or ‘sedatives.’ The former of these we have considered. The latter will now engage us.

Under the head of ‘sedatives,’ I include such agents as diminish action, directly or indirectly. The division comprises some of the most important classes of remedies which we possess, and such as are especially adapted for most of the numerous cases of acute disease, which prove so fatal to mankind. On some of them, indeed, in violent inflammatory cases, we repose our entire confidence; and, if they fail, our efforts are not likely to be of much service.

It may be said, that many of the local excitants, which we have considered, may be employed for the purpose of producing an indirect sedative effect, and such is the case with many; hence they also are used in febrile and inflammatory affections; but their sedative operation is not as evident from the commencement as those which we have ranked under the division of sedatives. In the case of one of the classes of sedatives, a markedly excitant operation is observable when the agent is administered in a small dose; and, perhaps, even when given to a larger amount, there is always some degree of excitation on careful examination, but this is succeeded so rapidly and predominantly by the depressing agency, that we totally disregard the excitant property, and have recourse to them in the same manner as if they were pure sedatives or sedatives proper.

The different classes of sedative agents are;—*sedatives proper*, *narcotics*, *refrigerants*, and *nauseants*; each of which it will be requisite to consider at some length.

SECTION I.

SEDATIVES PROPER.*

Definition of sedatives—Modus operandi—Thomson's table of sedatives—Mental sedatives—Bloodletting—Its Effects—Cautions respecting its use—Arteriotomy, phlebotomy, local bleeding—Other sedatives—Contro-stimulants—Homœopathy.

THESE may be defined “agents that directly depress the vital forces.” They are employed, consequently, whenever it is necessary to diminish preternaturally increased action. By many therapeutical writers, this class is not admitted, but there are certain remedial agents, which cannot be brought under any other head;—bloodletting, for example. The main effect is, doubtless, exerted, directly or indirectly, on the nervous system, and, through this, on other parts of the body.

The best evidence of their *modus operandi* is afforded by the most powerful pharmaceutical agent of the class with which we are acquainted:—I mean the hydrocyanic acid and the different compounds of cyanogen. If a drop of pure hydrocyanic acid be placed upon the tongue of an animal, its poisonous effects are so rapidly exerted, that the animal ceases to breathe before it can be removed from the lap of the experimenter. In this case, it is impossible to invoke any other mode of action than that induced through the contact of the poison with the nervous system. The instant this takes place, the lethiferous influence appears to be conveyed—with the rapidity of lightning along conducting wires—by the nerves to the great nervous centres, which seem to be instantaneously paralyzed, and all the functions carried on under their presidency are annihilated.

Yet it would not appear, that the heart and intestines, or even the voluntary muscles have their contractility destroyed, in poisoning by this fatal agent; and Professor Thomson thinks, that this is true also as regards other sedatives.† We could, consequently, understand, that if the deleterious agency of any sedative were extremely fugitive or evanescent, provided we could maintain artificial respiration—effect, that is, the conversion of venous into arterial blood—and keep up the circulation, time might be allowed for the nervous system to recover from the malign influence, and to resume its wonted action.

There are other circumstances, which confirm—were any con-

* Sedantia, from ‘sedo,’ I settle.

† Op. cit. i. 417.

firmation wanting—the position, that sedatives exert their influence on the nervous system. When hydrocyanic acid is applied to one limb only of a frog, the member becomes paralyzed, whilst the other limbs remain unaffected. Robiquet, whilst executing experiments on the tension of the vapour of the hydrocyanic acid, after having exposed his fingers to it for some time, felt a numbness in them, which lasted for several days, yet without experiencing any effect from the acid on his system.

Of the precise nature of the impression, made on the nerves by sedatives, we know nothing. The most careful examination exhibits no physical alteration of their tissue. It is manifestly not one of excitement, but the contrary: all the phenomena, as Dr. Thomson has remarked, prove that there are powers which destroy excitability and life, without previous excitement, or, at least, without any signs of it being discoverable.

The author to whom I have just alluded, divides all sedatives, from the nature of their effects, into two distinct classes;—‘direct sedatives,’ or those which operate immediately on the nerves,—and ‘indirect sedatives,’ or those which operate through the medium of the vascular system,—as in the following table.

“ A. DIRECT SEDATIVES.

* Organic products.

- a.—Cyanogen—combined with hydrogen, in
Hydrocyanic acid.
Laurel water.
Volatile oil of bitter almonds.
combined with potassium, in
Cyanide of potassium.

- b.—Empyreumatic volatile oil.
Tobacco smoke.

- c.—Nicotina—contained in the leaves of
Nicotiana Tabacum.

** Inorganic substances.

- d.—Sulphur—combined with hydrogen, in
Sulphuretted hydrogen gas.
Hydrosulphuret of ammonia.
e.—Carbon—combined with hydrogen, in
Carburetted hydrogen gas.

B. INDIRECT SEDATIVES.

- f.—Carbon—combined with oxygen, in
Carbonic acid gas.
g.—Bloodletting.

To this table might be added the sedation produced by a residence in certain localities, combined or not with the use of mineral waters—especially of the sulphureous kind—as at the Red Sulphur Springs of Virginia,—the waters of which are reputed to have a wonderful effect in reducing the pulse, and hence the place is a common resort, during the summer season, for the phthisical. To the same agency might be referred—a residence in mountain gorges, and in other situations, where there is a paucity of light, and an absence from excitants of all kinds; and certain emotions, which are of a depressing or sedative cast, and of which we have so marked an example in the nostalgic sadness, which, as I have before remarked, in the beautiful language of Rogers, exerts so deleterious an agency on the Swiss, especially when absent from his native land.

Although there may be some doubt entertained, as regards the action of certain sedatives,—whether the sedative influence is not preceded by some excitation,—there can be none as respects bloodletting. Even the hydrocyanic acid has been supposed, by Magendie and others, to produce a transient excitement in the first instance, followed, however, immediately afterwards, by an opposite state; but closer examination, added to experiments on animals, seems to exhibit these views to be hypothetical. Indeed there is not sufficient time, in most cases, to note any excitation, so rapid is the transition from life to death, when the sedative is administered in a state of concentration; and, when more diluted, the effects are clearly of a depressing character.

In the *modus operandi* of bloodletting there can be nothing equivocal. There can be no presumption of excitation before the depressing effects are perceptible; yet we can readily comprehend, that there may be states of the system, in which the abstraction of blood, instead of being followed by signs of sedation, may give occasion to greater activity of vessels, and to greater tone of the system than was apparent prior to the operation. Such is strikingly the case in the fevers termed ‘congestive,’ where the powers of life appear to be depressed, in consequence of the accumulation of blood in the internal organs; but if the oppressing or depressing cause be removed, by the abstraction of a due amount of blood, the powers of life develop new energy, the blood is regularly distributed through the different tissues and organs, and every sign of *asthenia* disappears.

The immediate effects of bloodletting on the system are readily appreciable. The impression is, from the first, one of sedation; and, accordingly, it is one of the sedative agents, on

which our main reliance is placed in diseases of excitement. Carried too far, however, it is well calculated to develop capillary excitement, in the mode to be mentioned presently. Some years ago, indeed, this was an evil which was never apprehended, and if, after excessive loss of blood, hyperæmia occurred in any organ, or was augmented, if it previously existed, the blood-letting was repeated, until the patient sank; the practitioner, not suspecting the cause of death, but consoling himself with the reflection, that the disease was irremediable and that he had adopted the only judicious course for its removal.

When an animal is bled to death, he is observed—as the blood flows—to become uncertain in his attitude; and, if he attempts to move, he staggers, and ultimately falls. This state is soon succeeded by convulsions, which, in death from hemorrhage, always precede dissolution. Precisely the same thing happens to the human subject, when death results from a rapidly fatal hemorrhage. The rationale of these phenomena would appear to be as follows.—As the blood flows from the vessels, the great nervous centres cease to receive that supply, which is requisite for the due performance of their functions; hence the proper amount of nervous energy is no longer transmitted to the muscles; their contraction cannot be maintained energetically; the alternate contractions and relaxations become marked—in the form of tremors; and, if the flow of blood continues, there is not enough of nervous influx transmitted to keep the extensors in a state of contraction; the animal consequently falls, and, unless the hemorrhage be now arrested, death is inevitable. The same inadequate supply of blood to the brain gives rise to irregularity of action in the cerebro-spinal axis, especially in those parts where the motor nerves arise; and hence we have convulsions.

Where hemorrhage takes place, naturally or artificially, to a less extent than this, and the individual recovers, a chain of analogous phenomena supervenes, with which it is important for the Therapeutist to be acquainted. It would seem, indeed, that whenever the vital fluid is lost beyond a certain amount,—and in particular habits this amount need not necessarily be large,—a series of symptoms present themselves, or are apt to present themselves, which are of a nervous kind, or dependent upon the loss of balance between the nervous and sanguiferous systems. Uterine hemorrhage affords us the best example of the effects of great loss of blood in the human subject, although we meet with too many cases of mischief from the lancet of the practitioner.

When blood is discharged to an inordinate extent from the uterus, a feeling of faintness is sooner or later experienced; impaired vision and depraved audition,—in the form of tinnitus aurium, or other unusual noises,—supervene; and, if the hemorrhage be not arrested, fatal syncope comes on, generally preceded by more or less convulsive movement. If the patient recovers, it rarely happens that the restoration is effected without symptoms presenting themselves, which are referable to the effect produced by the loss of blood on the nervous system. Perhaps, in the course of a few hours, although the female may have been, to all appearance, exanguinous, she will be found complaining of violent headache, suffused face, with throbbing of the temporal and carotid arteries; yet these symptoms, as I have elsewhere remarked, are certainly not referable to a condition of the blood or of the bloodvessels, which farther bloodletting is capable of remedying. The mischief has been induced by loss of blood, and farther abstraction of that fluid could scarcely fail to add to the pathological condition.

It may be laid down, perhaps, as a general law, that when blood is lost to a considerable amount, the great nervous centres receiving an inadequate—and the rest of the nervous system an irregular—supply of the vital fluid, their excitability becomes largely and irregularly developed, so that, under this impressible condition of the nerves, the bloodvessels, whose functions are carried on under their presidency, assume augmented action; and if, owing to the previous existence of hyperæmia in any organ, the nerves, proceeding to that organ, are in a morbidly excitable condition, a fresh developement of irritability may ensue after the bleeding, and the hyperæmic condition, instead of being relieved by the loss of blood, may be augmented by it. In individuals, whose nervous system is very excitable, precisely the same effects may be induced by a full bleeding, as I have described to result from excessive discharges from the uterus, and, accordingly, the practitioner is now cautious—where hyperæmic conditions occur in such individuals—in the use of the lancet, and if he employs it, he does not carry the depletion so far as to depress too much the powers of the system,—aware, that if he should do so, under the nervous irritability or neuropathia, which he developes, reaction might succeed to such an extent as to reproduce the exaltation of organic actions in the part, and perhaps to a greater degree of intensity than before the operation. It is in such irritable habits, that we find the advantage of adopting other sedative agents: it is in such, that a combination of

bloodletting, short of producing syncope, with a full sedative dose of opium, is often so serviceable;—the bleeding diminishing the exaltation of the vital manifestations, by acting on the nerves through the bloodvessels; and the opium preventing the subsequent developement of nervous excitability. This, I say, is advantageous in irritable habits; and, in strong individuals, the same plan pushed to a still greater extent, is equally successful and not the less philosophical, when employed for the removal of internal inflammations. It is the plan, which, as I have before observed, is adopted with so much success, in acute peritonitis;—the bleeding being carried so far as to make a decided impression on the system, and the opium administered in a full dose; a sedative influence is thus exerted on the body generally, and on the inflamed tissue in particular, under which the hyperæmia is effectually subdued.

My friend, Professor Smith, of the University of Maryland, attended a case with me not long ago in which many of the ordinary signs of inflammation of the encephalon were present, and in which we were both satisfied that great mischief would have resulted from copious abstraction of blood. The patient was a nervous female, who, soon after delivery, was attacked with excruciating cephalalgia, with the greatest intolerance of light and sound, so that every precaution was necessary to shut off those irritants. Along with this great impressibility, however, the tongue was moist, and the circulation, though hurried, not augmented in force. She was bled, but the symptoms were in no respect relieved. The operation was repeated to a trifling extent: so much palpitation and nervous turmoil were, however, induced by it, that it was not repeated; but leeches were subsequently applied to the epigastric region, for the removal of some accidental gastro-enteritic symptoms. This state of excitability of the encephalon continued for weeks, and at length yielded to time and quiet, rather than to any particular system of medication; and under the cautious reapplication of light and noise, to the optic and auditory organs, they became gradually accustomed to the stimulus, and the recovery was ultimately complete.

I am satisfied, that had depletion been carried to a greater extent in this case—as it would most certainly have been, by those practitioners, who believe that general bloodletting is the only agent, that can be relied on as an antiphlogistic, great mischief would have resulted. Long, indeed, before Dr. Marshall Hall had published his interesting ‘*Researches on the effects of loss of blood*,’ I had been deeply impressed with what appeared

to me the faulty views, entertained, both as regards the pathology and the Therapeutics of such cases as those I have mentioned; and had satisfied myself, that the maxim inculcated by many practitioners as applicable to internal inflammations in general—"when you have bled in inflammation to such an extent, that you are doubtful, owing to the persistence of the symptoms, whether you should bleed again,—bleed,"—was a faulty one, and often, I fear, attended with disastrous consequences. As a general rule, I would say, on such occasions of doubt and difficulty, "do not bleed, but have recourse to some other appropriate sedative, or revulsive agent, until your doubt is removed." Every practitioner, much engaged with the diseases of women, must have met with cases of peritoneal inflammation in the puerperal state, in which, after bleeding has been practised as far as he has esteemed it safe, the effects of a sedative dose of opium have been signally salutary. The irritability of the nervous system has been allayed by it; whilst, if the bleeding had been repeated, it might have been formidably developed.

It is only in comparatively late years, that the attention of Therapeutists has been directed to a pathological condition giving rise to phenomena of ordinary occurrence, which, in one of the cases, ought to have been suspected earlier, from the effects, which we see developed by loss of blood on animals, as well as on man. I allude to certain encephalic affections, which were at one time—and are even now, by many Therapeutists—considered to imperatively require the loss of blood, generally or locally, or both. Coma and convulsions were once looked upon as invariable evidences of 'congestion' of the encephalic vessels, although what was precisely meant by the term, as employed by many writers, is not apparent;—whether, for example, they looked upon the congestion as an accumulation of blood in the vessels of the brain, produced by too great activity of the encephalic arteries; or, as a remora of blood in the veins, owing to some asthenic or mechanical cause, seated in the vessels themselves, or in the parts in which they creep. Both conditions were, however, considered to indicate bloodletting—whether the turgescence, in other words, was active or passive, the abstraction of fluid was equally demanded.

It is now known, that coma may exist independently of any polyæmia or hyperæmia of the encephalon; that it occasionally appears to be induced by a condition the opposite to those I have mentioned, and that the administration of excitants may

be required for the removal of symptoms, closely resembling such as are cured by bleeding and by ordinary depletives.*

The precise condition of the brain during sleep has been an interesting topic of discussion with the physiologist, and is yet *sub lite*; but it may, we think, be unhesitatingly determined, that it is not directly dependent upon modified circulation in the encephalon; and that it is altogether a phenomenon of the nervous or cerebral structure itself. Coma—being morbid sleep—cannot be wholly likened to that which occurs naturally. It is, doubtless, frequently the result of pressure made on the cerebral substance by vascular turgescence, or effusion; but it may, and doubtless, does, occur from conditions of the cerebral structure itself; and it by no means follows, that these must be conditions of turgescence or excitement. Gooch has an excellent chapter on this subject in the work cited. It is entitled ‘Of some symptoms in children erroneously attributed to congestion of the brain;’ these he regards as dependent rather upon loss of nervous power. “I am anxious,” says he, “to call the attention of medical men to a disorder of children, which I find invariably attributed to, and treated as, congestion or inflammation of the brain, but which I am convinced often depends on, or is connected with, the opposite state of circulation. It is chiefly indicated by heaviness of head, and drowsiness; the age of the little patients, whom I have seen in this state, has been from a few months to two or three years; they have been rather small of their age, and of delicate health; or they have been exposed to debilitating causes. The physician finds the child lying on its nurse’s lap, unable or unwilling to raise its head, half asleep, one moment opening its eyes, and the next closing them again, with a remarkable expression of languor. The tongue is slightly white; the skin is not hot; at times the nurse remarks that it is colder than natural; in some cases there is at times a slight and transient flush; the bowels I have always seen already disturbed by purgatives, so that I can scarcely say what they are when left to themselves: thus the state which I am describing is marked by heaviness of the head and drowsiness, without any signs of pain, great languor, and a total absence of all active febrile symptoms. The cases which I have seen have been invariably attributed to congestion of the brain, and the remedies employed

* Marshall Hall, *op. cit.* p. 119: Abercrombie, ‘On diseases of the brain;’ Gooch, ‘Account of some diseases peculiar to women,’ p. 43, and Dr. A. T. Thomson, *op. cit.* vol. i. p. 416 and p. 450. See also, on ‘Nervous Apoplexy,’ Dr. A. P. W. Philip’s ‘Inquiry into the nature of sleep and death.’ Lond. 1834, p. 146.

have been leeches, and cold lotions to the head, and purgatives, especially calomel. Under this treatment they have gradually become worse, the languor has increased, the deficiency of heat has become greater and more permanent, the pulse quicker and weaker, and at the end of a few days, or a week, or sometimes longer, the little patients have died with symptoms apparently of exhaustion."

"I shall not encumber this paper," he subsequently remarks, "with a multiplicity of cases, but state that the above are only a specimen of a class, of which I have seen enough to convince me that they deserve the attention of the profession. If I had any doubt about this, this doubt would be removed by the fact, that Dr. Marshall Hall has already recognized them,* and described them in a paper which has been read at the Medico-chirurgical Society.† He therefore anticipated me in announcing them; but so far from regretting this, I am glad to support my statements by the authority of so observing and reflecting a physician. The only difference between our experience seems to be this—that he attributes the state which I have been describing to the diarrhœa produced by weaning, or to the application of leeches for some previous complaint. In most of the cases I have seen, however, the child has had no previous illness, and the leeches have been applied subsequent to the drowsiness, and as a remedy for it.

"The children, who were the subjects of this affection, and were thus treated, died, not with symptoms of oppressed brain, but with those of exhaustion; and, on examining the head after death, the bloodvessels were unusually empty, and the fluid in the ventricles rather in excess: in two instances death was pre-

* "Since the above was printed, and just before striking it off, I found the following passage in Dr. Abercrombie's 'Researches on the Brain,' p. 310:—'I have many times,' says Dr. Abercrombie, (page 310,) 'seen children lie for a day or two in this kind of stupor, and recover under the use of wine and nourishment. It is often scarcely to be distinguished from the coma which accompanies diseases of the brain. It attacks them after some continuance of exhausting diseases, such as tedious and neglected diarrhœa; and the patients lie in a state of insensibility, the pupils dilated, the eyes open and insensible, the face pale and pulse feeble. It may continue for a day or two, and terminate favourably, or it may be fatal. This affection appears to correspond with the apoplexia ex inanitione of the older writers. It differs from syncope in coming on gradually, and in continuing a considerable time, perhaps a day or two; and it is not, like syncope, induced by sudden and temporary causes, but by causes of gradual exhaustion, going on for a considerable time. It differs from mere exhaustion, in the complete abolition of sense and motion, while the pulse can be felt distinctly, and is, in some cases, of tolerable strength.' It does not appear that Dr. Abercrombie opened the heads of any of these children, and therefore it is doubtful what was the state of the brain with regard to the bloodvessels and the fluid in its ventricles."

† "A Short Report of the paper will be found in the 'London Medical Gazette,' for 1829."

ceded by symptoms of effusion, viz., blindness, a dilated pupil, coma, and convulsions; and after death the ventricles were found distended with fluid to the amount of several ounces, the sinuses and veins of the brain being remarkably empty. I believe the prevalent notion of the profession is, that all sudden effusions of water into the brain are the result of inflammatory action; but, putting aside for a moment this dogma of the schools, consider the circumstances of this case. For several days before death, all that part of the circulating system, which was cognizable to the senses, was at the lowest ebb consistent with life, and after death the bloodvessels of the brain were found remarkably empty of blood, and the ventricles unusually full of water. From such facts I can draw no other inference than this, that this sudden effusion was a passive exudation from the exhalents of the ventricles, occasioned by a state of the circulation the very opposite to congestion or inflammation. This is corroborated by the dissection of animals which have been bled to death. Drs. Saunders and Seeds, of Edinburgh, found that in animals bled to death, whether from veins or arteries, there was found more or less of serous effusion within the head, and Dr. Kelly thus expresses himself:—‘If instead of bleeding usque ad mortem, we were to bleed animals more sparingly and repeatedly, I have no doubt that we should succeed in draining the brain of a much larger quantity of its red blood; but in such experiments we shall, I think, find a larger effusion of serum.’ * * * “Though we cannot, by general depletion, entirely or nearly empty the vascular system of the brain as we can the vessels of the other parts of the body, it is yet possible, by profuse hemorrhages, to drain it of a sensible portion of its red blood, that the place of this spoliation seems to be supplied both by extra and intra vascular serum, and that watery effusion within the head is a pretty constant concomitant or consequence of great sanguineous depletion.* But if this is true, it is of great practical importance, for if we take delicate, feeble children, and by bleeding and purging for an imaginary congestion of the brain, reduce their circulation to a very low ebb, and keep it so, we run the risk of producing that very effusion of serum into the brain which we are endeavouring by our remedies to prevent.”

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“It is surely impossible for the reader to mistake me so far as

* Kelly ‘on the Pathology of the Brain.’ Trans. of the Med. Chir. Soc. of Edinburgh, Part i. 1828.

to suppose that I am denying the important practical truths, that heaviness of head and drowsiness of children commonly depend on congestion, and are to be relieved by depletion, and that acute hydrocephalus is a serous effusion, the result of inflammation, and capable of being cured only in the inflammatory stage, by bleeding and purging. These vital truths I would state as strongly as any man, but there are opposite truths. All that I mean is, that these symptoms sometimes depend, not on congestion, which is to be relieved by bleeding, but on deficient nervous power, which is to be relieved by sustaining remedies. All I advise is, that not only the heaviness of head and drowsiness should be noticed, but the accompanying symptoms also, and that a drowsy child, who is languid, feeble, cool, or even cold, with a quick, weak, pulse, should not be treated by bleeding, starving, and purging, like a drowsy child who is strong, plethoric, has a flushed face, perhaps swelled gums, and a heated skin. The cases which I have been describing 'may not improperly be compared to certain species of plants, by no means uncommon, which are liable to be confounded with others by an inattentive observer.'*

I have cited the above remarks at some length, in consequence of their marked accordance with the views I have been led to entertain in what have appeared to me to be similar pathological conditions; and I am satisfied, that both in children and adults, we often meet with an analogous state of the brain, and especially in scarlatina. In the disturbed state of the encephalic functions, which so often attends that anomalous disease, we recognize—it has appeared to me—a condition very different from that, which is produced by active inflammation or congestion in the encephalon. Under the great expenditure of nervous energy, which takes place over the whole of the capillary surface, and which is indicated by the inordinate activity of the agents of calorification, of which the organic nerves distributed to the capillary bloodvessels are the most important, the great encephalo-spinal centre appears at times to be in a state very different from that of inflammation or active congestion. It is rather exhausted by the unwonted energy of the organic portion of the nervous system; and accordingly, in many such cases, the use of diffusible excitants has been found serviceable,—the delirium or the coma gradually disappearing as the system begins to feel their compensating influence. This practice has

* Abernethy's Works, Preface, p. 7.

been adopted in scarlatina, when accompanied by such signs of encephalic disorder, with great success, by my friend, Dr. Baer, of Baltimore, and it has been followed by the most happy results in one or two cases, which fell under my own care. Under the vigorous use of depletives, the symptoms have not been mitigated; at times, indeed, they have seemed to be aggravated; but on changing the system of treatment, and having recourse to tonics or excitants, a marked amelioration has speedily ensued.

Convulsions were, at one time, universally referred to the same condition of the encephalon as was presumed to prevail in cases of coma; bloodletting was, therefore, the remedy almost always deemed proper; but some misgivings ought to have been produced by the well known fact, that death from hemorrhage is preceded by convulsions.

Amongst the immediate effects of loss of blood, Dr. Marshall Hall enumerates,—syncope, convulsions, delirium, coma and sudden dissolution; and, amongst the more remote,—excessive reaction, sometimes with,—*First*, delirium, mania; *Secondly*, coma, amaurosis, or deafness; and the sinking state.* Convulsion, he properly considers to be, after syncope, the most familiar effect of the loss of blood. “It constitutes,” he adds, “one species of puerperal convulsion, and should be accurately distinguished from other forms of this affection, arising from intestinal or uterine irritation, and an immediate disease of the head.” The very fact of the copious effusion of blood, with the attendant signs of exhaustion will enable the practitioner to discriminate these cases, and not to pretermitt the use of those energetic agents, which are indispensable for the safety of the patient, when the convulsions are induced by the condition of the gravid uterus modifying the due circulation of blood in the brain. It is not in such cases, that the use of the lancet does harm; on the contrary, it is the anchor of safety, and cannot be postponed. The mischief is here owing to the circulation in the brain being modified, so that the nervous system is thrown into irregular excitement, and nothing will obviate this condition, except diminishing the circulatory current. Far different, however, I am satisfied, is the generality of cases of convulsions, which happen during early childhood. Prior to the period of the first dentition, owing to certain evolutions of organs, the nervous system is, as we have previously seen, un-

* ‘The Principles of Diagnosis.’ Second Edit. New York, 1834, p. 200.

usually impressible, so that sources of intense irritation, existing anywhere, may be the occasion of irritative irradiations proceeding in all directions, until the parts of the cerebrospinal axis have their functions deranged, and sensation, volition, and mental and moral manifestations become, for the time, suspended. In this manner, the irritation produced by the pressure of a tooth against the gum, or any source of excitation in the intestinal canal may become the cause of convulsions; and, after the functions of the cerebrospinal axis have been once so far deranged as they are during convulsions, they are extremely prone to reassume the morbid condition, until, ultimately, organic disease of the encephalon occurs, or the little sufferer is worn out by continued irritation. Now, in such a case, the predisposition to the disease is—the period of life; and the exciting cause is—the irritation in the alimentary tube. Great mobility of the nervous system—great impressibility—is present even in health, and this impressibility only requires the application of a sufficient exciting cause to have convulsions developed.

In addition to this general predisposition, derived from time of life, there is doubtless an organization, obtained from progenitors, which predisposes to convulsions. We frequently see a whole family subject to them, during childhood; and, on inquiry, we may find, that one of the parents was liable to the disease in his childhood. In such cases, a less energetic exciting cause, is required to develop the mischief, possessing, as they do, a double source of predisposition. In the cases which I am now describing, we cannot invoke polyæmia, or hyperæmia of the encephalon. They are wholly neuropathic. The predisposition is unusual nervous impressibility; the exciting cause is often situated in the digestive tube; and very frequently the irritation there is produced by food of an improper character, or by some inflammatory or other morbid condition of the mucous or lining membrane. The indication cannot, consequently, consist in diminishing the quantity of blood circulating in the system, with the view of removing any supposititious congestion of the brain. Bloodletting, indeed, in such a state, could hardly fail to add to the mobility and impressibility of the nervous system, and it has appeared to me, in many cases, to have been followed, too manifestly, by augmentation of the symptoms. The convulsions have recurred; the surface has become cool, and pale,—almost exanguious; the circulatory forces have exhibited, that their action was enfeebled; the little sufferer has continued in a state of coma between the fits, or has had but short intervals of con-

sciousness ; and he has gradually sunk with no signs of hyperæmia,—unless we consider the convulsions and the coma to indicate such a condition—for, on dissection, no morbid appearances whatever have been met with in the brain, or that effusion of serum has been discoverable, which, as I have before shewn, is present, when we bleed an animal—and a healthy animal—to death.

Proceeding on those pathological principles, I have not often considered it proper to abstract blood in the convulsions of infancy ; in almost all cases, it has been but necessary to clear the alimentary tube by a gentle emetic, followed by a mild cathartic ; to keep the child from every source of irritation, that could act injuriously on his organs of sensation from without, or on the intestinal mucous membrane from within ; to equalize, as far as practicable, the excitability of the cutaneous surface by the use of friction or of the warm bath ; and, under this plan of management, I have almost always found the affection eventuate favorably. At the same time, it is proper to remark, that there are cases of convulsions accompanied by every sign of vascular excitement, and where a true polyæmic or hyperæmic condition of the brain exists. Here, of course, bloodletting is the main agent to be relied on. If encephalitis be present, it must be treated as encephalitis ; but, in all cases, the most careful attention must be paid to discriminate, whether the convulsions are accompanied or produced by a redundancy, or by a deficiency of nervous and vascular energy.

If bloodletting, then, be capable of exerting a sedative agency on the frame, and yet, if carried too far, or not appropriately practised, may give rise to all those mischiefs, that follow excessive loss of blood, it becomes an interesting topic of inquiry,—how to regulate the operation, where it is demanded, so as to have the sedative agency, without any of its unpleasant sequelæ.

When blood is drawn, in cases of internal inflammation, our great object is, by diminishing the amount of fluid circulating in the vessels, to depress the vital manifestations. But the effect of copious bloodletting, we have seen, is mainly exerted upon the nervous system ; and I have remarked, that when the loss of blood takes place, either naturally or artificially, to too great an extent, we find irregular actions apt to supervene ; and, as there is already a part of the nervous system disposed to be morbidly affected, where hyperæmia exists, we often discover, that under the influence of excessive irritability of those nerves, the vessels of the inflamed part resume their inordinate action, and the hy-

peræmia, after a full bleeding, is speedily reproduced to a like degree. We have obviously, therefore, to be careful not to carry the abstraction of blood, in these cases, to an extent that may develop irregularities in the nervous action. But this condition of irritability varies materially, according to individual organization, and to the character and intensity of the hyperæmia. There are some individuals, who faint at the sight of blood, and who are thrown into marked nervous excitement, by the abstraction of a few ounces—not more than an ordinary bleeding; whilst others will bear the loss of a very large amount, without the supervention of syncope, and without seeming to suffer materially from the operation. In certain diseased conditions, again, the toleration is considerable; and a delicate female will often bear a large loss of blood, when a few ounces, in health, or in a different affection, would have produced great nervous impressibility.

The toleration, too, varies somewhat in the same individual. Dr. Thomson says he has witnessed cases of decided inflammation, in which syncope occurred after three or four ounces of blood were taken: yet, on repeating the operation in a few hours afterwards, from twenty to thirty ounces were abstracted, without the least evidence of the approach of syncope.* I have more than once had occasion to confirm this; and it is a therapeutical fact of importance,—because, if we were to be deterred from repeating the bloodletting, owing to the want of toleration at the first attempt, we might deprive ourselves of the use of one of our most valuable antiphlogistics,—one, indeed, which is indispensable; yet, it does not appear to be philosophical, that, in a case of excited organic actions in a part,—say, in the pleura, or the peritoneum,—we should take away blood from the arm; or, in other words, that we should take away fluid from the whole system, in order to reduce the tumultuous action in a part. We have no mode, however, of getting at those vessels,—no mode, therefore, of applying our remedies to the parts concerned,—and we are compelled to act on the diseased organ, by the influence, which we are capable of producing on the nervous system generally, as well as by the diminution in the supply of fluid to the inflamed part, which must necessarily result from the operation.

From the great amelioration in the symptoms of inflammation, generally observed when syncope is induced from any cause, it has been deemed important, that bloodletting should always be pushed so far as to make this decided impression on the system;

* *Op. cit.* i. 455.

and there are some who regard the supervention of this condition as an evidence that bleeding has exerted its full effect, even although a few ounces only may have been abstracted. Nay, I recollect a case, in which fainting was occasioned altogether by the awkward attempts of a bungling provincial practitioner in France; yet it was regarded by him to be equally effectual for the removal of the hyperæmia, for which it was employed, as if twenty or thirty ounces had been taken, before the occurrence of the syncope. The state of fainting is one of suspended animation—of suspension of the great vital actions—and, therefore, it is a condition in which there must be a truce to the various excited actions, that may be going on in any part of the organism; but the effect is often only temporary; and, as soon as the functions of respiration, circulation, and innervation are restored, the signs of hyperæmia may be as marked as before. By many, indeed, the state of syncope has been compared to the cold stage of an intermittent, and reaction, it is conceived, is as sure to follow as the hot stage succeeds to the cold stage of a paroxysm of that disease. “The morbid effects of large depletions,” says a recent intelligent writer,* “will necessarily vary with the nature of the disease in which they are employed. When carried too far, in cases of excitement, where the nervous or vital power is not depressed, and the blood itself rich or healthy, reaction generally follows each large depletion, and thus often exacerbates or brings back the disease for which it was employed, and which had been relieved by the primary effects of the evacuation. This is more remarkably the case in acute inflammations of internal viscera, particularly of the brain or its membranes. Thus, every observing practitioner must often have noticed, that a large depletion, when carried to deliquium, will have entirely removed the symptoms of acute inflammation when the patient has recovered consciousness; and that he expresses the utmost relief. But it generally happens that the inordinate depression—the very full syncope that is thought essential to the securing of advantage from the depletion—is followed by an equally excessive degree of vascular reaction, with which all the symptoms of inflammation return; and the general reaction is ascribed entirely, but erroneously, to the return of the inflammation, instead of the latter being imputed to the former, which has rekindled or exasperated it, when beginning to subside. The consequence is, that another very large depletion is again prescribed for its removal; and

* Copland, in ‘A Dictionary of practical medicine, etc. etc.’ Art. ‘Blood.’

the patient, recollecting the relief it temporarily afforded him, readily consents. Blood is taken to full syncope—again relief is felt—again reaction returns—and again the local symptoms are reproduced ; and thus, large depletion, full syncope, reaction, and the supervention on the original malady of some or all of the phenomena described above as the consequence of excessive loss of blood, are brought before the practitioner, and he is astonished at the obstinacy, course, and termination of the disease ; which, under such circumstances, generally ends in dropsical effusion in the cavity in which the affected organ is lodged ; or in convulsions, or in delirium running into coma ; or in death, either from exhaustion or from one of the foregoing states ; or, more fortunately, in partial subsidence of the original malady, and protracted convalescence. Such are the consequences which but too often result—which I have seen on numerous occasions to result, when bloodletting has been looked upon as the only or chief means of cure—the ‘*sheet anchor*’ of treatment, as it too frequently has been called and considered during the last twenty years.”

To prevent this reaction from supervening, Dr. Copland directs the following mode of practice, when large bloodlettings are required in the treatment of visceral inflammation. The patient should be either in bed or on a sofa, and in the sitting or semi-recumbent posture, supported by several pillows. The blood is to be abstracted in a good sized stream, and the quantity should have some relation to the intensity and seat of the disease, and the habit of body and age of the patient, but chiefly to its effects : it should flow until a marked impression is made upon the pulse, and the countenance begins to change. Farther depletion must not now be allowed ; but the finger should be placed on the orifice of the vein, the pillows removed from behind the patient, the recumbent posture assumed, and the arm secured. “Thus a large quantity of blood may be abstracted, when it is required, without producing full syncope, which should always be avoided : and when a large loss of this fluid is either unnecessary, or might be hurtful, the speedy effect produced upon the pulse and countenance by the abstraction of a small quantity, will indicate the impropriety of carrying the practice farther. In this manner I have often removed about forty ounces of blood, where large depletion was urgently required, before any effect was produced upon the pulse, but always carefully guarding against syncope ; and by the subsequent means used to prevent reaction, no farther depletion has been

required.” The ‘means’ alluded to, consisted of controstimulant doses of tartarized antimony ; of full doses of calomel, antimony and opium ; of opium singly, &c. &c.

There can be but little doubt, that the course here recommended is judicious. I have already remarked, that in many nervous individuals, syncope may be induced, even before the blood flows, or when a very small quantity has been discharged. In this case, every thing is favourable for the occurrence of violent reaction, and no good whatever is to be expected from the temporary sedation effected during the syncope. The exaltation of the vital forces—to be permanently subdued—will generally require a copious abstraction of fluid from the vessels, and, by keeping the individual in the horizontal attitude, and waiting for a time,—pressing the finger on the vein when signs of syncope appear,—and, after they have passed away, removing the finger from the bleeding orifice,—blood enough can generally be withdrawn to produce the necessary effect. At other times, very large quantities of blood will be borne without the supervention of any evidences of syncope, and when there is great reason to believe the *toleration* would exist, until a slight additional abstraction of blood might throw the patient into a state of irretrievable collapse,—or, into what Dr. Marshall Hall has called—“ the sinking state.” In the lectures, of Mr. Lawrence, as given in the London ‘Lancet,’ is contained the case of a young female, of slender habit, on whom depletion was practised to a great extent: eight and forty ounces of blood were taken away without fainting being induced. The blood still continued running in a vigorous stream, without touching the surface of the arm, and it was stopped at that amount, only because the quantity seemed to Mr. Lawrence to be so very great.

In a case like this, it would manifestly not do to continue to bleed until signs of syncope supervened. When the practitioner has bled to thirty ounces, or at the farthest, to forty ounces, it would perhaps be wise to tie up the arm ; to follow up the sedative system by a full dose of opium, or some other sedative agent—and I know none so good in the vast majority of cases, where patients tolerate it—and if, in the course of three or four hours, the mischief, for which the bloodletting was practised, is not subdued, to repeat it.

The extent to which bloodletting should be carried, in cases of violent internal inflammation, is often a matter of great difficulty with the discriminating, but of no difficulty whatever with the reckless and uninformed. In his state of blissful igno-

rance, the latter continues to bleed, and consoles himself, when the fatal result has been hastened—perhaps mainly induced—by his agency, that the sufferer has fallen a victim to an incurable malady. Many have laid down a rule, before referred to, that when we have pushed the bloodletting to such an extent, and so often, that we are in doubt whether the operation should be repeated, the decision should be in the affirmative. But, with the disposition, which prevails so generally,—and which prevailed, a few years ago, to a much greater extent than it does even at present,—to bleed without due consideration, such a doubt will rarely be felt, without good ground at the same time existing for staying the hand ; and, therefore, the decision, according to my experience, ought generally, as I before said, to be in the negative. The argument commonly urged for the farther abstraction of blood is, that the inflammation manifestly persists, and that it must inevitably destroy if not arrested ;—that bloodletting is more likely to subdue it than any other therapeutical agent ; and that if it should not, the physician will have the consolation of knowing, that he has done every thing in his power to avert the melancholy termination. Were the abstraction of blood, in all cases and to any extent, devoid of danger, this mode of viewing the subject might be logical ; but mischiefs result from bleeding, in these and similar cases, which are fairly referable to the operation, and are equally serious in their results with the disease for which it may have been employed. Often, too, whilst the practitioner is taking away blood, he allows the patient to drink freely of water or other fluid, and, under the augmented absorbent agency induced by the diminution of the quantity of blood in the vessels, a state of anæmia or oligæmia supervenes, and the blood is rendered so thin and poor, that if the disease, for which repeated bloodletting is adopted, be hemorrhagic, and the hemorrhage be owing to transudation through the parietes of the vessels—as is almost universally the case—the recurrence of the hemorrhage is greatly facilitated. In an early part of this volume, I have referred to an interesting case of anæmia, produced by excessive bleeding in what was supposed to be periodical encephalitis, and to the mischiefs so manifestly referable to an inadequate quantity of blood circulating in the vessels, as well as to the impoverished condition of that fluid ; and, to a minor extent, similar evils are often found to result from the same causes, although they are, too frequently, not appreciated, or, if appreciated, regarded as inevitable. Whenever anæmia, of

the kind referred to, exists, the excitability of the nervous system is irregularly developed, and hyperæmic affections are apt to arise in various parts, which seem very formidable, and yet require a very different mode of management from such as are met with in those, who are plethoric, or whose blood is rich in fibrine and red particles.

Formerly—not many years ago, indeed—it was laid down, by many, as a rule of guidance, that bleeding, in a case of internal inflammation, ought to be repeated so long as the blood drawn exhibits the appearance of the buffy coat, but this is a rule which is now properly abandoned. It is clear, indeed, from the results of observation, that, in some cases, the blood would exhibit this character immediately before the occurrence of fatal syncope.

But this buff is not perceptible only in cases of high internal inflammation: we meet with it in acute rheumatism, in the pregnant condition, and in persons of great nervous excitability. In the first of these cases, we have no disorganizing inflammation present,—none, that requires the same activity of treatment to preserve life, that pleurisy, for example, demands; and, in the second of the cases, the buff appears, when the female is in perfect health.*

Perhaps, however, the most important of these facts to be borne in remembrance is the third—that we observe the buff on the blood of persons of high nervous excitability, even when no inflammatory condition may be present; and when, on the contrary, the blood is watery,—or, in other words, does not contain the healthy proportion of fibrine and red globules. They are cases that give rise to great hesitancy and difficulty in the mind of the practitioner, when signs of hyperæmia exist in any internal organ. Not long ago, I attended a case of this kind, in company with my friend Dr. Gibson, of Baltimore. The subject was an amiable and gifted young lady, whose temperament might be regarded as eminently nervous or impressible. She had been labouring under pain on breathing, but without much cough: the skin was, at the same time, hotter than natural,—markedly so at some periods of the twenty-four hours,—and the mucous membrane of the tongue, though moist, was coated, and indicated the existence of internal hyperæmia. She had been most judiciously treated: blood had been taken; and counterirritation established, both on the region of the chest and in the secretory system in general; for, the mouth had been slightly affected by

* See page 31.

mercury. A day or two before I saw her, she had expectorated blood in the morning, which was florid, but not frothy, and it was not brought up by any effort of coughing. At my first visit with Dr. Gibson, it was proposed by him, that blood should be drawn, not so much in consequence of the presence of urgent symptoms, but from the apprehension, that the affection, which appeared to exist mainly in the pleura costalis, might extend; whilst, at the same time, a knowledge of her temperament, and the character of her symptoms, suggested that the abstraction should not be carried to any great extent. The blood, previously drawn, was buffed, and this was regarded by us as one element in our decision, that a farther abstraction should be made. She was accordingly bled; and the blood was again buffed; but the crassamentum was small in quantity, and very thin; so that it could be laid hold of, and separated from the large quantity of serum in which it was placed, and be held up like a piece of leather. Only a small quantity was taken; and yet the depression produced by it was urgent, and sufficiently demonstrated the propriety of our great caution in the employment of the lancet. The pain was, however, entirely removed by it; and, by keeping up a centre of irritation, by means of the ointment of tartarized antimony, applied on the exterior of the chest, the symptoms were entirely removed.

For this fortunate termination she was mainly indebted to the discrimination of her attending physician, for had he carried the bloodletting too far, prostration would have ensued to a much greater extent; a corresponding reaction would have been established, and any hyperæmia that might have existed, would probably have been largely increased; yet, if the buffy coat of the blood were to be regarded, in all cases, as unequivocal evidence, that a farther abstraction of that fluid should be made, it ought assuredly to have been practised in this case, seeing that the appearance was marked; although, as I have said, the proportion of the crassamentum to the blood taken away was extremely small. In the case, too, of affection of the encephalon, which I described as having attended with my friend Professor Smith, the blood exhibited the buffy coat, and yet its abstraction, even in small quantity, induced violent palpitation and other nervous symptoms, which prevented us from repeating it.

We may lay it down, then, as a rule, that the appearance of the buffy coat on blood cannot, when taken singly, be regarded as a sufficient reason for its farther abstraction; and that the propriety of a repetition must depend upon other symptoms taken

along with the buffy coat: and farther, that such a coat may be present, when there is no inflammatory condition in the system, or when it is by no means to a dangerous extent.

The general views, that have been laid down with regard to the use of bloodletting, will have demonstrated the value of this therapeutical agent in inflammatory affections, and the circumstances that must be taken into consideration in judging of the extent to which the abstraction of blood must be carried, and of the best mode of after management, for reaping full advantage from it, where it may have been employed as far as the practitioner has deemed prudent, and yet where hyperæmia may still exist to some extent. The cases require the exercise of the nicest discrimination: yet bloodletting has been so much the fashion in all diseases of an inflammatory character, and—I may say—in all sudden diseases, that the public voice calls loudly for the use of the lancet in such cases; and the practitioner, led away by public clamour, and not sufficiently fortified by the possession of proper pathological and therapeutical principles, is found to fall in too frequently with the wishes of bystanders, who are commonly totally ignorant of the proper course to be pursued. If, too, he be not possessed of right presence of mind, he may adopt measures which his better judgment might by no means approve.

On a recent public occasion, I had an opportunity of advertising to some cases of this kind, which are of daily occurrence.*

A man falls from a height, bruised—stunned perhaps—and the general call is for a surgeon to bleed him; yet, at times, in such accidents, a shock is given to the great nervous centres—the brain and spinal marrow—the effects of which bleeding is well calculated to augment—and augment fatally—if it be employed immediately after the receipt of the injury, and before reaction has taken place. In like manner, if a person, when vehemently addressing an auditory, falls down suddenly in a state of suspended animation, the impression immediately is, that he has had an apoplectic seizure. A vein in the arm or neck, or the temporal artery, is immediately opened, and the state of suspended animation may, in this way, be converted into that of death. The heart has ceased to act, in such cases, and the abstraction of blood from the general circulation is not well adapted to restore it.

*‘An address, delivered to the Graduates in Medicine, at the annual commencement of the University of Maryland, on Wednesday, March 19, 1834.’ p. 13.

When a person is attacked with apoplexy, it rarely happens, that he dies instantaneously. A train of phenomena, characterized by the loss of sensation, volition, and mental and moral manifestations, succeeds for a time, and is the precursor of dissolution. Circulation and respiration, however, in the meanwhile, continue; but, where the heart dies first, the circulation ceases; respiration is no longer accomplished, and the state of suspended animation becomes converted, almost instantaneously, into positive death. This view has been confirmed by the cases of instantaneous death, which I have had an opportunity of examining. In almost all, the state of the heart has indicated, that the cessation of its action was the first link in the chain of phenomena.

The satisfaction, often felt at the exhibition of energy on the part of the practitioner, is well exemplified by an anecdote, which an illustrious native of this country—now no more—who had filled the highest office in the gift of a free people, and whom I had the honour of ranking amongst my personal friends—was in the habit of recounting.

Travelling from Virginia towards the north, he rested for the night at a tavern on the road; soon after his arrival at which, the hostess came in from a neighbouring house, with the females of her family,—all exhibiting marks of deep distress. He was informed that they had been witnessing the parting scene of a young friend, who had died of some acute affection. “But, thank God!” observed the contented matron, “every thing was done for him, that was possible, for *he was bled seven-and-twenty times.*” “It is not”—says the inimitable Molière, who was unsparing in his appropriate philippics against the profession, and the public of his day—“it is not, that, after all, your daughter may not die; but, at all events, you will have done something and you will have the consolation, that she died according to form.”*

Since the lecture, to which I have alluded, was delivered, my friend Dr. Wright, of this city, has put into my hands a work,† which he published twenty-one years ago, in an appendix to which are contained views so strikingly like those I promulgated on

* “Cen’est pas qu’avec tout cela votre fille ne puisse mourir, mais au moins vous aurez fait quelque chose, et vous aurez la consolation, qu’elle sera morte dans les formes.”—*L’Amour Médecin*, Act i. Scene v.

† ‘A historical and physical sketch of a malignant epidemick, prevalent in Maryland, and some other States within the last few years, etc., etc. Baltimore, 1815. 8vo.

that occasion, that they might be regarded as the prototypes of mine. His excellent 'sketch' had not, however, fallen under my observation: the coincidence of views is, therefore, altogether accidental, and it has afforded me no little satisfaction to find, that my sentiments have accorded so strikingly with those of such an excellent observer. The appendix contains a masterly notice of the views of the distinguished Rush, as contained in his 'Defence of Bloodletting.'

"'We must do something,' is the most unfortunate and pernicious maxim," says Dr. Wright, "which has ever been introduced into the policy of medicine. At the moment, when it received the sanction of professional reputation, professional imposture was legalized, and ignorance and artifice acquired confidence, from feeling security. I refer to no particular authority for the inculcation of this sentiment. It has unhappily been stamped with the approbation, and received the connivance of numbers, who could have wanted nothing but reflection to have refused it their assent. Its adoption has never wanted advocates; it has been eagerly received, and amply exercised; and the profession is to this day disgraced by the admission, that 'mankind must be amused.' Had half the pains been taken to acquire professional understanding, which have been practised to impose on society, this maxim might long since have been commuted for the more honorable sentiment, that mankind must be instructed.

"It is under the covert of this professional mask, that the prejudices of the world have been pressed into the service of the practitioner; and its ignorance arrayed against its security. It is thus that a convenient resource has been provided against that false shame, which dreads a candid avowal; and the physician, armed with implements, for whose use or consequence he apprehends no responsibility. Among the weapons of this licensed warfare against decorum and integrity, the *lancet* holds a distinguished rank. Like the sword of Alexander, it is the universal solvent of every difficulty; and has often been made to sever the gordian knot, which defective ingenuity was incompetent to unravel. Justice would be violated were those remarks pointed solely at the worthless herd, whose business is imposture; who openly repose their claims upon the hopes and fears, the follies and the weakness, of their fellow creatures. They reach even him to whom contingent circumstances have opened a more ample and elevated range in professional relation; who, without

an effort to improve that profession, is solicitous to enjoy by other means, the benefits of its exercise.”*

The whole of the author's remarks on the subject of bloodletting—as a therapeutical agent—are most judicious; and it is a matter of regret, that, owing to the exhaustion of the copies, the work is not available to the profession. It is to be hoped, however, that Dr. Wright will find leisure to lay before it the substance of the appendix, to which I have referred, with the modifications—if any—which have been suggested by his subsequent experience and reflection.

I have more than once alluded to the induction of syncope, as marking the effect produced by bloodletting on the functions; and this is the criterion established, by many practitioners, as to the requisite quantity of blood to be abstracted in cases of internal inflammation. In general, no harm may arise from the rule, but we have exceptions to this, as well as to all other general rules. Fortunately, the condition of inflammation impresses a degree of tolerance on the system, which, in the vast majority of cases, enables it to withstand the abstraction of blood, even when carried to an inordinate extent; but in the extreme ages—in early infancy, and in advanced life—the frame does not rally so readily from the sedation; and I am satisfied, from observation, that many persons at those ages have had their deaths hastened—if not mainly occasioned—by the too vigorous use of bloodletting. This is especially apt to occur in diseases, in which the degree of inflammatory irritation is not so great, as to communicate to the system the full tolerance; and especially in those cases of coma or convulsions in early childhood, to which I have previously referred, as being presumed to depend on ‘congestion,’ and, therefore, to require bloodletting. In these unhappy cases, the fancied signs of congestion increase after the operation; the farther abstraction of blood is, therefore, determined upon; the powers of life fail; effusion takes place into the ventricles of the brain; and the child dies from exhaustion,—that exhaustion being partly induced by the means adopted for the removal of the malady. Such is not, however, in all probability, the opinion of the practitioner. He consoles himself with the reflection, that the fatal event has been occasioned by the intensity of the disease. When a similar state of affairs occurs, he has recourse to the same management, with like results; and, at the end of a long life, he is perhaps ready to ex-

* Op. citat. p. 147.

claim,—that he has never had occasion to regret the employment of bloodletting, but has often reproached himself for not having pushed it farther. All this has arisen from the indiscriminate faith, placed in this valuable agent—valuable only when appropriately employed—by others besides the Sangrado of Le Sage.

“With regard to age,” says Professor A. T. Thomson,—“in infancy, the laxity of the solids, and the relative proportion of the serum or watery part of the blood to the crassamentum or clot, which consists of fibrin, and coloring matter, are more considerable than in adult age: bloodletting, by increasing this greater proportion of serum, proves hurtful; and a state of syncope in infants is always one of great danger. The first effect of exhaustion in such young subjects is an increased degree of irritability, which leads to stupor, and generally terminates in convulsions; the pulse is quickened, the pupil of the eye dilates, and symptoms closely resembling those which precede the effusion of water in the ventricles present themselves. I have seen this more than once occur in children in whom symptoms resembling those of inflammation of the brain, accompanying irritation of teething, have displayed themselves; and leeching or cupping has been resorted to; but, instead of affording relief, a state of evident defective stimulus supervened; and, in one case, snoring, stertor, and other appearances of apoplexy having followed the bleeding, more leeches were applied, and the infant died. This state is detected readily by attention to the state of the breathing, which seems to be performed almost wholly by the diaphragm; and is always accompanied with the evolution of much flatus; both circumstances denoting a very low state of the nervous energy. It is best obviated by white wine whey, opium and ammonia, administered warm, in small quantities, and frequently repeated. In youth, and in the vigorous and robust, on the contrary, reaction takes place, and is especially marked after repeated venesections; the most favorable age for bearing bloodletting is from eighteen to forty-five. In old people the reaction is extremely feeble; and, during the flow of the blood, exhaustion often steals on so insidiously and imperceptibly, that, when nothing injurious is anticipated, syncope appears; no reaction can be induced, or it is defective, and gives way to a state of positive sinking. The risk in such a case is extreme.”*

The dangers conceived to arise from general bloodletting, in

* ‘Elements of Materia Medica,’ etc. Vol. i. p. 451.

early childhood, are considered by some to be so signal, that they never have recourse to it, preferring leeches or cupping; but, if carefully practised, it is safe, and the impression, made upon the diseased condition—if one of active inflammation—is usually more markedly salutary. The abstraction should not, however, be carried so far as to induce syncope. Owing to one or more fatal events having succeeded to the operation, in Edinburgh, the Professors,—during my attendance on the lectures there,—were in the habit of inculcating great caution in regard to its use at this early age. Of the propriety of the same caution in advanced life, I had a striking instance soon after I commenced practice. It was, indeed, of so alarming a nature, that it could not easily be forgotten. An elderly gentleman was directed to be bled, for chronic bronchitis, and I was requested to perform the operation. After the abstraction of a few ounces, syncope rapidly supervened, and it was so long before the vital functions were restored, that I became seriously apprehensive he would die under my hands. He ultimately recovered, but a considerable period elapsed in this stage of exanimation or transition between life and death.

The same caution is requisite, in taking away blood when there is much disease about the heart or great vessels. I have known two cases, in which the syncope, induced by bloodletting, practised for the removal of symptoms of internal hyperæmia, became the syncope of death; the irritability of the heart seemed to be suddenly destroyed, so that it never resumed its pulsations. In one of the cases, the existence of organic disease of the heart was known; but the individual seemed as if he could tolerate a copious abstraction of blood; before, however, a few ounces had been taken, he fell from his chair, and expired. In such doubtful cases, the patient should be placed in the horizontal posture, and the flow of blood be arrested, before any very marked effect appears to be exerted upon the functions of innervation or circulation.

Such are some of the main points, to be borne in view, in the employment of general bloodletting as a therapeutical agent, in inflammatory affections especially. There are cases, however, in which our object is to bleed to positive syncope—to relaxation—and where we have no fears of the supervention of reaction; as where we are desirous of overpowering forcible muscular contraction, or of reducing strangulated hernia. With this view, we place the patient in a sitting posture, and let the blood flow from a free orifice in one or both arms.

There may, however,—as I have already remarked,—be cases, in which general bloodletting may be unadvisable, and yet where topical bleeding may be advantageous. There was a time—and, indeed, the feeling still exists with a few—when it was maintained, that there can be no case in which topical bloodletting appears to be required, which could not be relieved, and more effectually, by blood drawn from the general system; and certain practitioners have gone so far as to express their regret, that such agents, as a leech, or a scarificator and cupping glass were ever known. There is, in these cases, some defective observation—modified, perhaps, by the existence of ancient and preconceived opinions—which interferes with the correct observation and reflection of the practitioner. I have repeatedly satisfied myself, that the local abstraction of blood has produced the most beneficial results, when general bloodletting had been—or would, to all appearance, have been—entirely ineffectual. In many of these cases, however, the beneficial result was not perhaps owing so much to the blood drawn, as to the attendant revulsion,—a *modus operandi* of bloodletting—general as well as topical—which I have elsewhere considered.

Since those remarks were written I have had an opportunity of witnessing a case, full of didactic information.

Dr. Hintze, of this city, (Baltimore,) requested me to visit with him the engineer of one of the Philadelphia steamboats, who was labouring under violent abdominal pain, aggravated at intervals, with some degree of tenderness on pressure, vomiting, and obstinate constipation. The state of the tongue, and of the circulation—indeed all the symptoms—indicated, that spasm was the predominant affection. As, however, there was tenderness, and apprehension that true inflammation might be rapidly developed, under the severity of the symptoms; and, likewise, with the view of resolving the spasm, Dr. Hintze very properly bled him in the morning, to the extent of thirty ounces,—and, in the course of the day, the bandage having slipped from the orifice of the vein, a few ounces more blood were lost. The pain was not, however, in the slightest degree, relieved by it. A powerful sinapism was placed over the whole of the abdomen, which excited the surface satisfactorily, and calomel, in combination with opium, had been administered, but still no relief was afforded. In the evening I met Dr. Hintze, when it was decided, that the patient should be freely cupped over the whole of the abdominal region; and that he should continue the pills of calomel and opium—five grains of the former agent, with two of

the latter, to be given every two hours,—commencing after the cupping had been accomplished, if the pain should require it. Seven cups were accordingly placed over the abdomen, and although he had experienced no intermission from the pain for upwards of forty-eight hours, relief was obtained soon after the application of the glasses, and before the operation was finished the pain was entirely removed: the calomel and opium were, however, continued for some hours, and, under their influence probably, the spasm did not recur, so that, when we saw the patient on the following day, he was so well, that it was unnecessary to repeat my visit. The bowels were not, however, evacuated, but under the castor oil, which was directed to be taken, they resumed their functions, and the recovery was complete.

Now, in this case, it will be observed, general bloodletting had been freely, but ineffectually, used—as well as counterirritation by the mustard cataplasm—before cupping was resorted to; yet the morbid condition yielded to a union of local bloodletting with revulsion; and the case furnishes a sufficient answer to the notion entertained by some practitioners, that no advantage is to be derived from the combination, which could not be equally obtained either from bloodletting, or revulsion, used singly, or from a combination of general bloodletting with cutaneous revulsion. The case is only one, indeed, of a multitude, which might be adduced, from the result of my own observation, as well as from that of other practitioners, who are accustomed to employ topical bloodletting, and to carefully and unprejudicedly note its effects.

It has been a common remark, that local bloodletting—when not used as a revulsive, but simply with the view of diminishing the quantity of the circulating fluid, and of acting, in this way, on the powers of the system—is extremely inefficient, and cannot therefore be relied on when internal inflammation exists. This is, however, an erroneous position. By multiplying the number of cups, or leeches, we can as certainly, although not always as effectually, reduce the organic actions, as by opening a vein; but the blood flows more gradually, and is, consequently, adapted for cases, where venesection might not be appropriate. Every practitioner, too, who has employed leeches freely, must have met with cases, in which the most marked effects have been produced by the abstraction which they effected. Each good American leech, if we reckon the quantity of blood, that may be encouraged to flow from the leech bites, may be regarded as

abstracting a third of an ounce of blood ; and, consequently, if we apply as many leeches as some of the modern French practitioners are in the habit of prescribing in gastro-enteritic, and other inflammatory diseases, we may take away a larger quantity of fluid from the vessels than we could do with impunity from the vein of the arm.* Twenty or thirty ounces constitute a large bleeding, and it will rarely happen that the lesser quantity can be taken from the arm without the supervention of syncope, and the inconveniences, which we have seen, in particular habits, are apt to follow that state, whilst a much larger quantity can be abstracted under the gradual flow that takes place, either when leeches or cups are the agents.

It has fallen to my lot to witness some alarming cases of exhaustion, especially in children, where leeches have been applied : in two cases indeed the result was fatal. In both the cases due attention had not been paid, and a large amount of blood was lost before the cause of the sinking was discovered ; and in one of them every attempt to arrest the flow of blood failed. These cases are rare, but they constitute objections to the use of leeches which do not apply to cupping,—the flow from the wounds made by the scarificator being readily arrested. When practicable, the leeches should be placed over bone, in order that pressure may be conveniently made on the bleeding vessels, should such a course be requisite.

“ When leeches are applied to soft parts,”—says an author to whom I have often referred,—“ for instance, to the abdomen, it is truly astonishing how much blood sometimes is detracted ; particularly when a poultice is applied over the bites, and the patient is kept warm in bed : to prevent, therefore, injurious symptoms of exhaustion from such a circumstance, the poultice should be frequently examined. This is more likely to occur in children than in adults ; and in children it not unfrequently happens that the bleeding cannot be stopped without encircling the orifice with a ligature. On this account leeches should never be applied late at night on children ; for, as the application of leeches in infancy must be regarded as a species of general bloodletting, the precise number which will regulate not

* Mr. Gill,—an experienced leecher of this city, (Baltimore,)—informs me, that there is not much difference in the quantity of blood, which the American, the Turkish, the German, or the Spanish leeches can contain. This may be estimated at about a quarter of an ounce ; but they differ essentially as respects the flow they occasion from their bites. By the Turkish and the German, an ounce may be lost, including the quantity swallowed by the leech ; and by the Spanish, half an ounce ; whilst we can scarcely calculate on more than a third of an ounce from the American.

only the quantity, but be equivalent to rapidity in the detraction of the blood should be determined; but the bites should be instantly closed, on observing that the system is brought under the influence of loss of blood.”*

In all cases of hyperæmia, occurring in the child, or in the adult, the Therapeutist—it need scarcely be said—will have to exercise the best of his judgment as to the propriety of the adoption of general or local bloodletting, or both.

It is not a true position, that general bloodletting can always be substituted for local bloodletting with equal advantage—nor does the converse of the proposition hold good. Both general and local bloodletting diminish the quantity of blood circulating in the system; they are both, therefore, adapted to cases of polyæmia or plethora, although the former is more available than the latter, where copious detraction of the fluid is necessary; but general bloodletting is not adapted, as we have seen, to every case of hyperæmia. In some cases, a small quantity of blood, obtained from the inflamed part itself, will afford instantaneous relief, when general bleeding has been used in vain; and there are cases, again—as I have shown, when treating of ‘excitants’—which are relieved by stimulating the vessels to contraction, after both local and general bloodletting have totally failed.

It must be borne in recollection, that inflammation is not caused directly by the condition of the general circulation, but by a morbid state of the capillary vessels of a part. Inflammation may attack the arteries and veins themselves, and even this is not, or need not be, connected with the blood in the inflamed vessels, but may be dependent upon a pathological condition of the nerves and vessels that supply their coats. Bloodletting, consequently, even in this case, can be but an indirect agent. By diminishing the amount of circulating fluid, it may reduce the activity of the capillary vessels, and thus remove the hyperæmia, but it exerts no direct sedative agency on the vessels themselves. Such is the fact in every case of inflammation. The action of the capillaries is distinct from that of the heart; and as I have before remarked—inasmuch as inflammation is produced by a morbid condition of the capillaries—the most philosophical plan of medication would be, to direct our remedial agents to those vessels; but as this cannot always be effected, we are compelled to have recourse to the only succedaneum we

* Thomson, *op. cit.* i. p. 458.

possess—the abstraction of blood from the general system, and the sedation, which this is capable of effecting. In affections of certain parts of the organism, we can have a choice of vessels so as to enable us at times to empty the affected capillaries, or to reduce the quantity of blood circulating in them more effectually; but our sphere of action, in these cases, is extremely limited, and I do not know, that we have any, in cases of internal inflammation. We can understand, that if hyperæmia were existing in the hand, blood, taken from the bend of the corresponding arm, would empty the vessels concerned more freely than if it were taken from the other arm, or from the external jugular; but, in hyperæmia of an internal organ, we have no mode of opening a vein between the inflamed part and the heart. It has, indeed, been recommended, that, with the views here laid down, blood should be taken, either from the temporal artery, or from the external jugular vein, in cases of inflammatory affections of the encephalon, but very slight reflection will shew, that no signal advantage is to be expected from this course; and, indeed, plausible arguments might be advanced for the purpose of proving, that the disadvantages might overbalance the presumed benefits. For example, blood, in every case of the kind, where the artery is opened, must come from the external carotid—a vessel which does not supply the encephalon—and, consequently, it cannot be supposed, that any benefit could accrue from selecting this vessel, in a case of encephalitis; it may be argued, however, that if more blood be solicited into the temporal artery, less will pass along the internal carotid; but this argument, again, might be combated—and philosophically—under the view, that as both the internal and external carotid arise from one trunk, any cause, which could solicit blood into the one, might attract a larger afflux along the common trunk; and, therefore, augment the flow along both branches—the internal as well as the external.

The same reasoning applies to phlebotomy, when practised upon the external jugular vein, in head diseases. If we could open the internal jugular vein, we might assuredly materially affect the state of the encephalic vessels, by emptying the sinuses, which, by their union, constitute the internal jugular veins; or rather, which supply them with blood; but this is impracticable; and, as the external jugular conveys the blood back to the subclavian from the exterior of the head only, no advantage can accrue from selecting it, where the encephalon is in a pathological condition.

It has been proposed by many, that a branch of the temporal artery should be opened in cases of violent ophthalmia; but the proposition has, I think, been hazarded without due examination. If we could always take blood from the ramifications, that proceed towards the eye, and, after the bloodletting, destroy them, by cutting them across, the plan might be advantageous, but unless we divide those very branches, the effect may be any thing but salutary. By obliterating some of the arterial ramifications, more blood might be distributed to the others, and, in this way, the ophthalmic branches might become developed, and more mischief than good accrue from the operation. Owing to these objections, arteriotomy is not often had recourse to, in such cases; it is rarely, indeed, employed, except in cases of sudden seizures, as of apoplexy; and it is then employed, rather on account of the ease with which it can be executed—in the absence of bandages, &c.,—than in consequence of any therapeutical preference, which should be given to this mode of abstracting blood.

The essential difference, after all, between topical and general bloodletting, is, that, by the one, we abstract blood from the capillaries; by the other, from the larger vessels. Now, in internal inflammation, topical bloodletting cannot be employed on the vessels of the part. It must be effected at a distance from the seat of the mischief; and, accordingly, its operation is of a mixed character,—combining depletion, and revulsion; but, in cases of external inflammation, we can make our depleting agents affect the vessels themselves, which are morbidly implicated. With this intent, cupping is rarely used. The operation cannot well be borne on an inflamed surface, owing to the pressure of the cups. Scarifying the part is, however,—in diffusive inflammation especially,—a most energetic agent, and half an ounce of blood, discharged from the overdistended vessels, will be followed by more benefit than all other remedies together. Mr. Lawrence has well shewn the marked utility of free scarifications through the integuments in the diffusive inflammation of the skin, which constitutes erysipelatous inflammation; and in those varieties of erythematous inflammation of the fauces,—which are attended by deep dusky redness, and very painful deglutition, without any great degree of swelling of the mucous membrane of the fauces or of the subjacent parts, I have seen the most signal relief afforded by scarification through the membrane. The pain on deglutition has been almost instantaneously removed, and the cure has been rapid. In all such ca-

ses, the scarification should be free. The blood generally flows readily from the divided vessels; retraction of their extremities takes place, and the new adhesive inflammation is substituted for the more sluggish and asthenic kind, which constituted the original affection. Like good effects supervene on scarification of the tunica conjunctiva, in inflammation of that membrane.

Blood is sometimes abstracted from the capillaries of an inflamed part by means of leeches; but it has been made a question with the reflecting, whether leeches are not likely to occasion more mischief than benefit, owing to the irritation excited by their bites, and the afflux of blood to the part, caused by their sucking. Apprehensive, that such may be the consequence, many Therapeutists are in the habit of applying them on the sound parts, in the vicinity of the seat of inflammation; but here, again, it may be a question, whether there are not evils attending this practice, which are weighty.

When the leeches are applied over an inflamed surface, they obtain the blood immediately from the affected capillaries. This, of itself, ought to be salutary. But it is asserted, that their bites become centres of irritation, and that they may augment the phlogosis. This may be the case; but in the generality of instances the new action, thus excited, has perhaps an opposite effect: accompanying, as it does, the evacuation of the dilated capillaries, it may excite their tone, prevent subsequent distension, and thus remove the hyperæmia. When, however, the leeches are applied near to the inflamed part, they cannot empty the affected capillaries, and by attracting blood into the neighbouring vessels, they may occasion a greater afflux towards the capillaries of the inflamed part. I am not much in the habit of applying leeches immediately on the part in cases of external inflammation; but where I have done so, they have not seemed to me to be followed by the aggravation of symptoms, which some have anticipated, and in many cases marked relief has been experienced. Where applied at all, it appears to me they should be placed over the inflamed vessels, rather than in their vicinity.

The conflicting views, which I have mentioned, have been, and are, frequently entertained in cases of mastitis, occurring after delivery. Whilst some recommend general bloodletting, and revulsion effected by powerful emetics and cathartics; others advise the application of leeches; whilst others, again, are of opinion, that their employment is not productive of any advantage. I have used them in such cases more than once, and it

has appeared to me with advantage ; but I have seen more benefit from the employment of agents of the excitant kind. The loose texture of the *mammæ* allows the capillary vessels to be readily distended ; an asthenic condition is thus induced in them, which is the source of excitation in the arterial ramifications continuous with the asthenic capillaries, and this asthenic condition is best removed by the application of excitants—as of heat considerably greater than that of the body—to the inflamed part.

Where we are desirous of obtaining a larger quantity of blood than would flow spontaneously from leech bites, or than would flow from them, when encouraged by the application of cloths wrung out of warm water, or by that of a warm poultice, cups are sometimes placed over the bites. In this way, a considerable quantity of blood may be abstracted, and we have the advantage of the revulsion, which the cupping glass is capable of accomplishing, should the propriety of such revulsion be indicated.

Of the other sedative agents, enumerated by Dr. Thomson—in the table cited from him—I cannot say much. I have frequently employed the hydrocyanic acid and its compounds, where a sedative has appeared to be needed, but the results have not satisfied me, that they were owing to the remedy administered. It has been conceived to be especially appropriate in diseases, which depend on increased irritability of the nervous system, and in those connected with a state of excessive sensibility. In fevers—intermittent or continued—it is rarely used ;—why, is not so clear. Dr. Thomson asserts, “that in no kind of idiopathic fever—either intermittent or continued—has the hydrocyanic acid been employed ;” but in this he is mistaken. There are practitioners, who have used, and continue to use, it in such affections. By many it has been esteemed beneficial in hectic fever, but this, again, is doubtful. In all the *phlegmasiæ*—in every kind of *hyperæmia*—simple, or accompanied with hemorrhage—it has been tried, and numerous testimonials have been offered in its favor. Even in the formidable disease—*phthisis*—it has been extolled—inordinately extolled ;—moderating the cough, it is affirmed, and lessening the hectic. All this, again, is more than equivocal. It is in the diseases, belonging to the class ‘*spasmi*’ of Cullen, that its powers are looked upon as most conspicuous ;—in diseases, in other words, in which it is extremely difficult to appreciate therapeutical agencies. In asth-

ma, even when the pulse was small, irregular and often not easily distinguishable, it is said to have acted almost as a charm, removing the suppressed breathing, and restoring the free play of the respiratory organs; and in hooping cough, it is regarded by Professor Thomson* 'as the sheet anchor of the practitioner.' "I do not think," he adds, "I am stretching my praise of it too far, in affirming, that few cases of this disease would prove fatal, were the hydrocyanic acid early resorted to, and judiciously administered. After emptying the stomach with an emetic, and purging briskly, the use of the acid should be begun, and the prescription never altered, except to increase the dose of the acid. When thus treated, the disease seldom continues more than a month or five weeks. *It is necessary to confine the little patients to a graduated temperature, and to keep them altogether upon a milk and vegetable diet.*"

These are high encomiums; but the language savors more of enthusiasm than of accurate observation; and it is probable, that the other means—referred to, in the part of the quotation, marked in Italics—had no little agency. I have often used the hydrocyanic acid, and endeavoured to observe its effects carefully and unprejudicedly. The results have not been such as to enable me to place much reliance upon it; and it certainly has not answered in my hands, in the very cases mentioned by Dr. Thomson, half as well as narcotics employed so as to produce a sedative influence. I now rarely prescribe the hydrocyanic acid.

Dr. Thomson has not included, in his table of sedatives, a set of therapeutical agents, now much used, in Italy more especially, but also adopted in France and in Great Britain,—rarely in this country:—agents, which, by removing excitation, might be termed 'sedatives,' but, which, by their propounders, have been called 'contro-stimulants,' and the theory, which suggests them, the 'theory of controstimulus,'—the 'new medical doctrine of Italy,'—'*La nuova Dottrina*, &c.

Prior to the termination of the last century, the doctrines of Brown were universally embraced in Italy, and they continued in vogue, until Rasori, on the occasion of a petechial fever making its appearance in Genoa, subjected the prevalent doctrines

* Op. cit. i. 435.

to considerable modification; and, as in most similar cases, ended by embracing diametrically opposite views. Rasori maintained, that the greater part of diseases, to which mankind are liable, are owing, either to an augmentation of excitability, or to an excess of stimulus; and he conceived, that there are certain medicinal agents, which possess a peculiar debilitant power, and which act upon the excitability of the frame in a manner directly opposed to that in which stimulus acts upon it. To this power he gave the name 'controstimulus.'

The mode, in which the different controstimulants have acquired their reputation, appears to have been as simple as it must frequently have been fallacious. Every agent, which succeeded in removing a sthenic disease, could do so only, it was presumed, by diminishing the excitability or removing the stimulus. Accordingly, it was a contro-stimulant. Substances were therefore classed together, which bore no relation to each other, either in their immediate properties, or in their secondary effects—as regarded the physiological phenomena they induced. We find, in the lists, emollients—as milk and gum; astringents—as the acetate of lead; tonics—as gentian, simarouba, iron, and, according to some, even the cinchona; excitants—as turpentine, squill, and arnica; emetics—as tartarized antimony and ipecacuanha; narcotics—as stramonium and belladonna; acrid poisons—as arsenic, nux vomica, cantharides; and a host of other animal, vegetable, and mineral substances, which had no kind of analogy to each other. It has been properly observed, that this manner of considering the effects of medicines tends essentially to bring together the most dissimilar substances, as well as to separate such as are closely allied, and, consequently, to confound all.*

In the case of this theory, however, as of every other, the practice, built upon it, has added valuable facts to Therapeutics; and not the least of these is the knowledge, that tartarized antimony may be administered in large doses, in inflammatory affections, not only with impunity, but with marked advantage. This potent emetic may be given to the extent of ten or twenty grains or more, in divided doses, during the day, without either producing vomiting or purging, or, if the first doses prove emetic, a tolerance is soon acquired, and the subsequent doses may be followed by no marked effect, except the diminution of the febrile symptoms. At other times, the urinary and cutaneous

* Guersent in *Art. Contre-stimulant*, in '*Dictionnaire de Médecine.*'

depurations appear to be largely augmented, and rapid emaciation succeeds to its administration. The contrastimulant physicians maintain, that the exaltation of the vital manifestations, in febrile and inflammatory diseases, enables the system to bear the large doses of this and other contrastimulants, and they say, that the tolerance vanishes with the disorder that communicated it; but this assertion is not confirmed by experience. There is, certainly, a greater resistance to the action of these agents, as there is to bloodletting, when all is exaltation, but the power of resistance does not cease, although it is diminished, when the exaltation ceases. Some individuals, too, never possess the necessary tolerance; so that, with them, the tartarized antimony does not produce its contrastimulant effects; and it would seem, that there are, also, what the French term medical constitutions, or epidemic conditions, which forbid its employment. Thus, according to Bricheteau,* although it was so successfully used in 1831, it could not be beneficially administered at the end of 1832, and the beginning of 1833. Not until the autumn of this last year, could it be resumed advantageously. On one occasion it was given in the Hospital, by an *Elève de garde*, during the choleric epidemy. The most violent symptoms supervened, and the patient died of cholera morbus, no sign of which existed before the tartrate was taken.

Of the different phlegmasiæ, acute rheumatism and pneumonia are those, which are considered to have been most successfully combated by this agent, in a large dose. "Emetic tartar," says M. Bricheteau, "should generally be preceded by bloodletting; and commonly it is advisable not to have recourse to the former, unless the latter is insufficient, except in cases in which bloodletting is contra-indicated, or impossible, owing to some special circumstances,—as happened to me once in the case of a rickety individual, who had no veins proper for phlebotomy. The medical constitution of the season is, also, occasionally opposed to the abstraction of blood: in such cases the tartrate of antimony and potassa is a valuable agent. Recourse may, likewise, be had unhesitatingly to the tartar emetic, at the very first, when the patient is exhausted by age or other causes, and appears to be too weak to bear the abstraction of blood; or, in cases where a positive refusal is given to the proposition for phlebotomy."

* * * "This agent must, also, be of great advantage, and of convenient employment, in country situations, where the

* 'Clinique médicale de l'hôpital Necker.' Paris, 1835, p. 8.

physician can rarely pay his visits at an early period. It may be practicable, by this method, and with the aid of an intelligent person, to regulate the treatment of a case of pneumonia or of rheumatism, for several days, after having premised a copious abstraction of blood, if it be considered desirable." The fact, however, referred to by Bricheteau—that it is not every one who presents the necessary tolerance—would render this agent by no means as easy of application by the *laity*, as he presumes.

Granting—and it would seem it must be granted—that the tartrate of antimony and potassa is a sedative agent; it becomes interesting to enquire into the mode in which such agency is exerted. The tartrate, as is well known, is one of our best suppurants, when we are desirous of establishing a centre of fluxion on some part of the cutaneous surface, with the view of removing an internal disease. Experience, too, has sufficiently shewn, that, when given in large doses, it produces pustulation in the mouth and fauces, if not lower down in the alimentary tube. In a case, which occurred in the Baltimore Infirmary, during the last summer but one, this effect of the antimonial was strikingly evidenced. Bricheteau—who has administered it largely, as a controstimulant—says its local action is exerted more particularly on the mouth, tongue, and pharynx, where false membranes and pustules are occasioned by it, but these lesions, he thinks, are by no means common. The œsophagus, he says, never participates in them; and they are more frequent in the intestinal canal than in the stomach: and, in the former, the lower part of the small intestines, and the commencement of the large, exhibit themselves more sensible to the action of the antimony than other portions of the tube; but it cannot be said, that sufficient opportunities have occurred for testing the effects of the remedy, and for separating the morbid appearances which have presented themselves, and which may have proceeded from other causes. Bricheteau is of opinion, that the lesions which may be referred, with the greatest probability, to the use of the tartarized antimony,—although he admits they are frequently owing to other inappreciable causes,—are—injection or infiltration of the submucous tissue of the intestines, and softening—*ramollissement*—of the mucous membrane. In the mouth, considerable inflammation—either pustular or ulcerous—is sometimes observed, which speedily disappears after the discontinuance of the antimony.

Every fact and argument tend to the conclusion, that the controstimulant virtues of the tartarized antimony are dependent

upon its revulsive properties; that this revulsion is produced in the lining membrane of the alimentary canal; that when it is accomplished, the excited actions, going on elsewhere, become diminished, and more or less nervous and vascular concentration takes place towards the seat of the artificial revulsion. Rasori thought, as we have seen, that the remedy lessens stimulation, or augmented excitability, directly: Laennec maintained that it invigorates the action of the absorbents; whilst Vaidy,—a French practitioner, who embraced the precepts of the followers of the '*Nuova Dottrina*,—is of opinion, that its influence extends immediately to the circulation of the blood, restoring its harmony, and subduing the febrile excitement. Perhaps all these views are inaccurate, and probably the true explanation is the one I have suggested. Bégin asserts, that none of the hypotheses cited can stand the test of attentive inquiry, and that they are not founded on well observed facts. "They are all in contradiction to experiments made on living animals, which prove, that tartar emetic, whilst it stimulates, and tends to inflame the mucous coat of the alimentary canal, from the cardia to the lower portion of the rectum, irritates the nervous system, and produces more or less inflammatory engorgement of the lungs:"—and he adds: "this remedy acts chiefly as a revulsive in the treatment of pneumonia, and we shall have occasion to develop this truth, when treating of the revulsions, produced on the gastro-intestinal system.*"

The doctrine of the controstimulants reposes on the received belief, that diseases are cured by remedies that are counter to them,—‘*contraria contrariis medentur*;' but an imposing medical sect has attempted, and is attempting, to overthrow this doctrine, and to set up the opposite,—‘*similia similibus medentur*.' The ‘Homœopathists,’ as they are termed,† maintain, that there are remedial agents, which can produce symptoms similar to those of disease, and that every dynamic affection of the living organism can be destroyed by another of still greater intensity, and permanence, that strongly resembles it.‡ They maintain, indeed, that the curative virtues of medicines are *solely* de-

* ‘*Traité de Thérapeutique*.’ I. 159.

† From *ὅμοιος*, ‘like,’ and *πάθος*, ‘disease.’

‡ *Organon der Heilkunst*, Von Samuel Hahnemann; 5te Auflage. Dresden und Leipzig, 1833; S. 94.

pendent upon the resemblance their symptoms bear to those of the disease. There are but three modes, they affirm, of applying medicines in disease; *first*, the ‘homœopathic;’ *secondly*, the ‘allopathic,’* or ‘heteropathic,’†—the method in general use: “without ever regarding that which is really diseased in the body, it attacks those parts that are sound, in order to draw off the malady from another quarter, and direct it towards the latter; and *thirdly*, the ‘antipathic,’‡ ‘enantipathic§,’ or ‘palliative:’ “by this method physicians have, till the present time, succeeded in affording apparent relief, and gained the confidence of their patients, by deluding them with a temporary suspension of their sufferings.”||

Upwards of a quarter of a century ago, Samuel Hahnemann—the founder of the ‘homœopathic medical doctrine,’—first propounded his opinions in the authoritative form of the ‘*Organon der rationellen Heilkunde*’—‘Organ of rational medical science.’ The book was issued from the Dresden press, but it did not at first attract, in a marked manner, the attention of physicians. In 1819, a second edition appeared, under its present title,—the epithet *rationellen*, or ‘rational,’ having been omitted. Since that time it has passed through two editions, and the English reader, who is not a German scholar, is now enabled to peruse it through the medium of a translation.¶

It is not my intention to inquire into the principles and merits of this fantastic doctrine at length; but a few observations may be indulged. The cinchona appears to have been the first drug experimented with by Hahnemann. Whilst occupied in translating the *Materia Medica* of Cullen into his own tongue, he was dissatisfied with the explanation of the febrifuge powers of the drug, and determined to make trials upon himself. He took it in considerable quantity, while in perfect health, and found that it produced symptoms like those of ague. Hence, he inferred, that intermittents are removed by the cinchona, in consequence of its exciting in the system a morbid condition, similar to that for the removal of which it is administered.

Again,—say the homœopathists,—mercurial preparations, when administered internally, produce symptoms—local and

* From *αλλος*, ‘another,’ and *παθος*, ‘affection.’

† From *ἑτερος*, ‘another,’ and *παθος*, ‘affection.’

‡ From *αντι*, ‘against,’ and *παθος*, ‘affection.’

§ From *εναντιος*, ‘opposite,’ and *παθος*, ‘affection.’

|| Op. cit. § 54 to 56.

¶ ‘The Homœopathic Medical Doctrine, etc.’ translated from the German by Charles H. Devrient, Esq. with notes, by Samuel Stratten, M. D. Dublin, 1833. 8vo.

constitutional—so closely resembling the symptoms of syphilis, that medical practitioners, who have spent years in the investigation of syphilis, find it difficult, and in some instances impossible, to distinguish one disease from the other. If the venereal poison produces pustules, scales and tubercles, mercury does the same. If syphilis is attended with inflammation of the periosteum and caries of the bones; so is the action of mercury. “Inflammation of the iris from lues,” says Dr. Stratten, “is an every day occurrence; the same disease is a very frequent consequence of mercury. Ulceration of the throat is a common symptom of syphilis; the same affection results from mercury. Ulcers on the organs of reproduction are the result of both the poison and the remedy; and furnish another proof of the doctrine *similia similibus*.”

“Nitric acid is generally recommended in cutaneous diseases; the internal use of this remedy in a very dilute form, produces scaly eruptions over the surface of the body; and the external application of a solution, in the proportion of one part acid to one hundred and twenty-eight parts water, will produce inflammation and ulceration of the skin. These observations would lead to the conclusion, that nitric acid cures cutaneous diseases, by the facility it possesses of producing a similar disease of the skin. Nitrate of potash, administered internally, in small doses, produces a frequent desire to pass water, accompanied with pain and heat. When this state of the urinary system exists as a consequence of disease, or the application of a blister, a very dilute solution of the same remedy has been found beneficial.

“The ordinary effects of *hyoscyamus niger* are vertigo, delirium, stupefaction, and somnolency. Where one or other of these diseased states exists, it yields to small doses of the tincture of this plant. The internal use of *hyoscyamus* is followed by mental aberration, the leading features of which are jealousy and irascibility [?]. When these hallucinations exist, this remedy is indicated.

“Opium in general causes drowsiness, torpor, and deep sleep; and yet this remedy, in small doses, removes these symptoms when they occur in disease.

“Sulphur is a specific against itch; notwithstanding which, when it is administered to healthy individuals, it frequently excites a pustular eruption resembling itch in every particular.”*

* Op. cit. p. vi.

Dr. Stratten asserts, that these deductions are drawn from actual experiment; and so, we are told, are all the positions advanced by the homœopathists.

The doses of medicines, administered by the homœopathists, are infinitesimally small; the millionth degree of dilution is very common. The following extract from Hahnemann's treatise on chronic diseases, as given by Dr. Stratten, will shew to what an extent the farce is carried.

“Of homœopathic medicines, take one grain of those which are solid, (mercury being included in the number,) or one drop of those which are liquid; put this small quantity on about the third part of a hundred grains of pulverized sugar of milk in a porcelain capsule that is not glazed; then mix the medicine and the sugar of milk together for a moment, with a spatula of bone or horn, and pound the whole strongly during six minutes. The mass is then detached from the bottom of the capsule and pestle during four minutes, in order that it may be perfectly homogeneous, and then rub down afresh during six minutes with equal force. Collect the whole of the powder into a body during four minutes, then add the second *third portion* of the sugar of milk, and mix the whole for an instant with a spatula; then triturate with force during six minutes. This is to be once more scraped together during four minutes, and rubbed again for six minutes. Stir the whole together during four minutes, and add the *last third* portion of the sugar of milk, which is to be mixed by turning it about with the spatula; then triturate the mass powerfully during six minutes, scrape it together during four minutes, and the whole is finally to be rubbed down for six minutes. After the powder has been carefully detached from the capsule and pestle, put it into a phial, and let it be corked and labelled with the name of the substance, and the mark $\overline{100}$, which shews that the substance is in the hundredth degree of attenuation. To carry the medicine to the ten thousandth degree of attenuation, take one grain of the powder marked $\overline{100}$, prepared as above, add the same to the third part of an hundred grains of pulverized sugar of milk, mix the whole in the capsule, and proceed in such manner, that after having triturated each third portion with force during six minutes, scrape the mass together during a space of four minutes. The powder, when thus prepared, is put into a well corked bottle with the figures $\overline{10,000}$ marked on the exterior, which will point out its degree of attenuation.

The same method is observed when this second powder marked $\frac{1}{10,000}$ is to be carried to the millionth degree of attenuation," &c. &c.*

The homœopathic method can only be regarded as a branch from the 'expectant' stem; and it is liable to every objection that applies to the latter. The Homœopathists argue, however, that, inasmuch as very small portions of a chemical substance can be detected in a solution, so may minute portions be capable of impressing the organism. For example,—say they—one grain of nitrate of silver, dissolved in one thousand five hundred and sixty grains of distilled water, will yield an evident gray precipitate—perceptible in every part of the fluid—when two grains of muriatic acid are added to it;—and again:—when one grain of iodine is dissolved in a drachm of alcohol, and mixed in the same quantity of distilled water as in the last case, and to this two grains of starch, dissolved in an ounce of water are added, an evident blue tint is produced in the solution. In these experiments, consequently, the grain of the nitrate of silver and iodine must have been divided into one-fifteen thousand two hundred and sixtieth of a grain. These experiments, however, are in no wise elucidative of the position;—for although such minute portions of chemical agents may be detected by the senses, it by no means follows, that they can exert a remedial action. Accordingly, when the homœopathic system has been impartially tried, it has not been found to succeed in the manner asserted by its supporters.† Like the expectant method in general, it is totally inefficient in acute cases; but, like it, where advantage is to be derived from trusting to that recuperative power, which is seated in all living bodies, its adoption is beneficial. This is one of the useful lessons, which it aids in teaching us. Another, perhaps, is,—the propriety, now universally admitted, of simplicity in our prescriptions,—in consequence of the greater or less uncertainty that must often exist—where two or more agents are thrown together—whether they may not mutually modify each other's action. The Homœopathists believe, that every disease carries with it a great susceptibility for the proper medicine; and, accordingly, they lay down the rule, that only one simple medicine must be administered to the sick at a time.‡

* Op. cit. 312.

† For a detail of Homœopathic experiments, by M. Andral, at the Hôpital de la Pitié, see 'Edin. Med. and Surg. Journal,' Oct. 1834; and 'North American Archives of Medical and Surgical Science,' No. 6, p. 443.

‡ Organon der Heilkunst, s. 272.

TABLE

OF THE CHIEF REPUTED SEDATIVES, AND THEIR OFFICINAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
<p>Acidum Hydrocyanicum. Acidum Prussicum. <i>Hydrocyanic Acid.</i> <i>Prussic Acid.</i> (And other compounds of Carbonogen.)</p>	<p>By passing hydrosulphuric acid thro' a solution of cyanuret of mercury in distilled water, until it is fully saturated, and filtering; then adding carbonate of lead, more than sufficient to saturate any excess of hydrosulphuric acid, and again filtering.</p>	<p>.....</p> <p>Aqua-Lauro-Cerasi. <i>Water of Cherry Laurel.</i> (Fol. lauro-ceras. lb. 1; aquæ O iij.; distil a pint, and add sp. lavand. c. oz. 1.)</p> <p>Potassii Cyanidum. Potassii Cyanuretum. <i>Cyanide of Potassium.</i> <i>Cyanuret of Potassium.</i> (Made by exposing ferrocyanate of potassa to a long continued red heat, in a crucible. From the mass that remains, the cyanuret may be dissolved, and evaporated to dryness.) Dissolved in water—in the proportion of one part to eight—it becomes the <i>medicinal hydrocyanate of potassa</i>; which may be given in the dose of</p>	<p>m 1 or 2.</p> <p>Sometimes used as a lotion, in impetigo, and other cutaneous affections;—(f. dr. 2 to O ½.)</p> <p>m 30 to f. dr. 1.</p>
<p>Acidum Hydrosulphuricum. Acidum Hydrothionicum. <i>Hydrosulphuric Acid.</i> <i>Hydrothionic Acid.</i></p>	<p>In the liquid state, by disengaging the sulphuretted hydrogen from a mixture of one of the sulphurets with dilute sulphuric acid, and causing it to pass into water.</p>	<p>.....</p>	<p>Varies according to the strength of the solution. It must be administered cautiously.</p>
<p>In the gaseous state, it is the gas hydrogenium sulphuratum. <i>Sulphuretted Hydrogen.</i></p>	<p>Disengaged in the manner above mentioned.</p>	<p>.....</p> <p>Liquor Ammoniaë Hydrosulphatis. Hydrosulphuretum Ammoniaë. <i>Solution of Hydrosulphate of Ammonia.</i> (Aq. ammon. f. oz. 4. Saturate, by passing hydrosulphuric acid through it.)</p>	<p>Inhaled in cases of phthisis, —mixed with atmospheric air —by allowing the gas to escape into the apartment.</p> <p>m 5 or 6.</p>

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Tabacum. <i>Tobacco.</i> The leaves of the <i>Nicotiana Tabacum</i> . (Active principles,— <i>Empyreumatic oil</i> , and <i>Nicotianine</i> , or <i>Nicotine</i> .)		Infusum Tabaci. (Tabac. dr. 1; aq. bullient. O j.	Used as an injection in strangulated hernia, &c.
		Unguentum Tabaci. (Tabac. recent. oz. 1; adipis lb. 1. Boil the tobacco in the lard, until it becomes friable, and strain.)	Used in irritable ulcers, tinea, &c.— <i>cautiously</i> .
		Vinum Tabaci. (Tabac. oz. 1; vin. O j.	Used, generally, as a diuretic —m 10 to 30.
Missio Sanguinis. <i>Bloodletting.</i> 1. General. Phlebotomy. Arteriotomy. 2. Capillary. Cupping. Leeching.			
Gasia. } Gases. } (In the way of inhalation.)			{ diluted with atmospheric air.
Gas } { Azote { Carbonic acid?.. { Hydrogen { —carburetted.. { —sulphuretted.. { (See above.)			{ with 4 to 6 parts { with 4 to 6 parts { with 4 or 5 parts { with 20 parts.

SECTION II.

NARCOTICS.*

Definition of Narcotics—May be used as excitants, and as sedatives—
—Their action elucidated by that of opium—May act locally as well as generally—Mental narcotics—Therapeutical application of narcotics
—In febrile diseases—In the phlegmasiæ, &c.—Table of narcotics.

NARCOTICS greatly resemble, in their action—when administered in appropriate doses—the class of medicinal agents, which has just engaged attention. They differ from them, however, in several respects. Whilst the action of sedatives is not preceded by any degree of excitation, that of narcotics always is. In minute doses, indeed, narcotics may produce none of the effects that characterize them when given in large doses. Their agency may be altogether excitant; and, with the view of obtaining the modification in the organic actions, which such agency is capable of exerting, they are occasionally exhibited in small quantity.

Narcotics may be defined—“agents, which first excite and then diminish nervous action, and in appropriate doses stupefy.” The power of stupefying may be esteemed one of their main characteristics.

Although the above definition may apply generally to their operation, when they are administered in a dose proper to produce a narcotic influence, it is obvious, from what has been said, that it is not wholly applicable, when they are given as mere excitants; in such case, they may not “diminish nervous action, and induce sleep.” They can then, however, be regarded as excitants only; but, in adequate doses, the latter part of the definition is strikingly appropriate; and the effects mentioned,

* *Obstupefacientia*, *stupefacientia*, from *ναρκη*, ‘stupor.’

must be regarded as the most essential consequents on the employment of this class of medicinal agents.

Even when narcotics are administered in a full dose, some degree of excitation is first perceptible; the functions of circulation, innervation, and secretion become more or less modified: the pulse beats more rapidly, and forcibly: the skin is hotter and drier than natural; the nervous system exhibits greater impressibility; and the mouth and fauces are dry, or their ordinary secretions are more tenacious than natural; but these evidences of excitement soon pass off—more rapidly in proportion to the size of the dose—and a train of phenomena, indicating sedation, follows those of excitement; the respiration becomes slower; the skin may be moist; the pulse reduced to the natural standard, or even below it; the impressibility of the nervous system is obtunded; the tongue becomes moist; and all the symptoms exhibit that a sedative and soothing agency has been exerted. Perhaps, in every case, however large the dose of the narcotic, some degree of excitement might be perceived as a precursor of the sedation, were due attention paid; but the sedative effect of a very large quantity of any of the narcotics supervenes so rapidly on the stimulant, that the attention of the practitioner is scarcely directed to the latter operation—especially as it is not the one for the production of which he has given the agent.

We can understand the marked difference between a stimulant and sedative dose of the same agent, from the cases, so often related in the newspapers, of persons, who, for wagers, have swallowed, at once, large draughts of some alcoholic liquor. The sedative effects of this powerful excitant—powerful that is, in a smaller dose—are so speedily exerted, that a stop may be put to all the functions, without their being any marked symptoms of previous hurry in the organic actions.

When a narcotic—say opium—is taken, the first effects occur in the nerves distributed to the lining membrane of the stomach. These are rendered less impressible, and the obtunding influence is soon extended to the great nervous centres, which are affected like the nerves with which the narcotic first came in contact. In this manner, the function of innervation generally has its activity diminished; and, therefore—directly as well as indirectly—the gastric functions may be impaired. If the narcotic be taken before eating, and when a marked desire for food is present, the appetite will be diminished or extinguished, under the new condition of innervation. If food has been received into the stomach, chymification will, for the like reasons, be retarded;

and the whole of the digestive operations—chymification, chyli-fication and defecation—will exhibit an obvious degree of torpor. We can thus readily comprehend, that the use of a narcotic may be followed by constipation, and that it may be well adapted for diarrhœa, where an indirect astringent agency appears to be indicated. The precise *modus operandi* of the narcotic may, in these cases, vary with the dose: where it is large, the whole function of innervation may be blunted; and not only the secretions, but the peristole of the intestines may be diminished; whilst if the dose be smaller, the effect may be mainly exerted upon the nerves distributed to the gastric apparatus, without the rest of the nervous system materially participating. In cases of diarrhœa, opium, like every therapeutical agent, has a relative action; and the same may be said of its employment in other morbid conditions. If irritation or inflammation exists in any portion of the alimentary canal, such irritation or inflammation may be allayed by a sedative dose of a narcotic; and, in this way, the pathological condition being removed, its symptom—the increased number and morbid character of the evacuations—may cease likewise.

It has been a very common remark, that opium is not well adapted for cases of pneumonia, bronchitis, &c., because it ‘diminishes the secretions,’ but this appears to be a very faulty method of explaining its action. The suppression of secretions is not a pathological condition—is not a disease. It is only the symptom of such a condition, and when we state, that the indication is ‘to restore the secretions,’ if the expression have any meaning at all, it can only convey the idea, that the pathological condition, which occasions the suppression of the secretion, must be removed. Now, we know, that the first consequence of the inflammation of a mucous membrane is a diminution of its wonted secretion; and that, after the inflammation has persisted for a time, an increase of the secretion takes place, but it is no longer of a healthy character. It is a secretion, accomplished by vessels laboring under inflammatory excitement. Two opposite effects, then, on the secretory function, are produced by different stages of inflammation. Yet, the indication, in both cases, must be alike. It must obviously be,—to remove the pathological condition, of which these effects are symptomatic. Now, a narcotic we know to be, in appropriate doses, a sedative;—that is, it is capable of diminishing the force of the circulation, and the energy of innervation. It is, therefore, well adapted for acting as a controstimu-

lant—for allaying inflammatory excitement. A knowledge of its properties would suggest to us the propriety of its employment in the diseased state of mucous membrane, which I have instanced; and experience ought to shew—as it does daily shew—that in one of the conditions assumed—that is, in the early period of mucous inflammation—it will restore the secretions; and, in the other, where the mucous secretion has become profuse, and morbid, it will diminish them,—by diminishing the inflammation that occasioned them. It is obviously, therefore, incorrect to lay down the broad law, that ‘opium diminishes the secretions,’ and that its use is improper whenever the indication is ‘to restore the secretions.’ Such an indication ought never to be imagined. It is unmeaning, and can only have been suggested in the ignorance of true pathology. In cases of pneumonia, where the expectoration has been free, a diminution of the sputa has seemed to supervene on the administration of narcotics; but this has been owing to the agent not having been administered in a dose adapted to the pathological condition of the pulmonary organs. Where the opium is given in a small dose—as is too often the case—it will as surely add to the inflammation, as the same amount of any other excitant; and if we add to the inflammation, we may arrest the secretion altogether, by bringing back that condition of the tissue, which existed at the onset of the inflammation; but if, in this very case, a full sedative dose were administered, none of the evils might be found to follow. The sedative would allay the excited organic actions, and if the secretion were diminished—as it probably would be—it would be a fortunate diminution, because arising from lessened inflammatory excitement in the lining membrane of the bronchial tubes, or in the parts in their vicinity.

Another example may be taken, where the secretions and excretions are manifestly facilitated by narcotics. I have said, that opium is administered in cases, where there is an undue number of alvine evacuations, with the view of exerting a constipating effect. But it is no less administered, where constipation itself is dependent upon certain pathological conditions. When enteritis or inflammation of the peritoneal coat of the intestines is present, constipation is a common concomitant; whilst, if the inflammation be seated in the mucous coat, diarrhœa is as common. Why this difference should exist is owing to the inflammatory condition of the follicles, and of the mucous membrane generally, being accompanied, after the disease has continued for a short

time, by augmented secretion. It might seem, however, that, as the peritoneal coat so closely invests the muscular, the latter might be thrown into inordinate contraction, and an increase be occasioned in the number of the evacuations from this cause. Such contraction does exist, but the necessary irritation in the lining membrane is wanting to induce diarrhœa; the contraction of the fibres has more of the character of spasm; whilst a derivative effect is perhaps exerted, owing to the concentration of the excited organic actions in the peritoneal coat diminishing the amount of secretion from the mucous coat; and, in this manner, constipation comes to be one of the phenomena of peritoneal enteritis. In such a case, opium, judiciously administered, exerts its sedative agency; diminishes the inflammatory action in the peritoneal coat, and resolves the spasm in the muscular coat; so that the causes of the constipation being obviated, it ceases, and we thus have a laxative, or cathartic effect, induced by remedies, which, in other pathological conditions, are well adapted for producing opposite results. These are cases, which exhibit the value of the possession of sound pathological and therapeutical knowledge. We discover empirically the property of our drug, and, having accurately appreciated the agency it is capable of exerting, we can say *à priori* what will be the pathological condition, in which the greatest benefit may be reaped from its employment. Accordingly, as I remarked in an early part of this volume, analogy has led to the employment of the invaluable agent—opium—in cases, in which some years ago it would never have been ventured upon. Some pathologists have considered it best adapted for phlegmasiæ of the peritoneum—both of the membrane proper, and its extensions over the different viscera. Such was the case with the indefatigable investigator into the diseased conditions of the animal economy—Armstrong. In these phlegmasiæ, he conceived it to be *perhaps* the most efficient therapeutical agent that we possess; and, although he esteemed it best to unite it with bloodletting, and to repeat both remedies according to the urgency of the case, he was disposed to think, that if he himself were laboring under peritoneal enteritis, and were told, that he must repose his hopes upon the lancet singly, or upon opium singly, he should be disposed to select the latter.

Now, what Armstrong said of the use of opium, in these cases, has been extended to similar pathological conditions in other serous tissues, as well as in the various tissues constituting the organism; and many are the advantages, that have accrued

from its employment, in some form of preparation, where, at one time, its use was unknown, and its employment considered inappropriate. It is not many years since a case of extensive injury occurred, in which it was considered advisable to procure rest by opium. The physician, with whom I was associated, and who was well acquainted with the main points of his profession, but had no experience of the use of opium as a sedative, was willing to administer an ordinary dose of laudanum—say 25 or 30 drops—but when I proposed 65 or 70 drops, he asked, with an air of surprise, if I was not afraid of producing excitement by so large a dose! It is the want of knowledge of the essential difference in the action of narcotics, according to the dose, that has occasioned opium to be discarded, in cases of undue vascular and nervous excitement, for the removal of which it is so admirably adapted. Impressed with an unfavorable sentiment towards its use—a sentiment derived from authors, and teachers—the young practitioner is apt to administer it in phlegmasial affections,—either in doses so small, that no sedative effect is induced; or, in his caution, he strikes the medium ground between stimulation and sedation: in the former case, he witnesses, perhaps, an aggravation of the excitement, and, in the latter, either no effect whatever on the disease, or one of aggravation; and he, therefore, too hastily concludes, that the use of opium is, in such cases, inappropriate and injudicious. Under these feelings, he never employs it afterwards, and yet he conceives himself entitled to say, from *experience*, that opium is, in no case, advisable, where inflammation is present.*

Such were the views strenuously inculcated when I commenced the study of the profession of medicine; and many a practitioner of the present day, who may entertain them, will find, that his impressions have been derived in the manner I have mentioned. A little experience sufficed, in my own case, to induce me to throw off the trammels of authority, and the judicious remarks of Armstrong confirmed me in my course. Both in public and in private practice, I have administered it largely; and, from the results, I am prepared to say, that we have not in phlegmasiæ in general a more valuable agent, if we except the lancet; and there are obscure cases of inflammatory action—in puerperal females especially—where it can be advantageously

* In a recent work on Therapeutics we have the following remark:—"Concerning the operation of opium, medical sentiment continues to be divided, though the preponderance is decidedly in favor of its stimulant properties, and with such an impression it is employed." Chapman's 'Elements of Therapeutics,' etc. vol. ii. 111

employed when the lancet cannot. It has, indeed, been argued, that where such affections have been relieved by opium, the very fact shews, that they were not inflammatory, and I have heard it argued, that we may often mistake neuralgic diseases for inflammatory, as is sufficiently shewn by the circumstance, that narcotics completely remove affections, which were previously supposed to be inflammatory. The result in no respect invalidates the diagnosis. Opium is a precious sedative, and it is, therefore, as well adapted for the one class of cases as for the other.

A very slight reflection, on the mode in which opium relieves pain, will place this subject in a striking light. It will shew how a narcotic may prevent the aggravation of diseased action. If we apply opium to a part of the dermoid surface, whose organic actions are morbidly modified, the effect of the narcotic may be exerted on the nervous ramifications themselves; their impressibility may be obtunded; and the irritation, under which they have been laboring, may be no longer appreciated by the brain. In the same manner, if the narcotic be swallowed, its effects are exerted upon the nerves of the stomach, and, through them, on every part of the nervous system. The brain no longer appreciates the irritation, or does so in a diminished degree. The irradiations, which would otherwise have been reflected over every part of the economy are consequently arrested, and, by the simple arrest of morbid sympathies, the amount of disorder must be diminished. In like manner, the induction of sleep, by a full dose of opium, will, at times, allay tumultuous actions of the nervous and vascular systems, which could not have persisted without adding to the amount of morbid mischief.

In the disease of colica pictonum we have a state of the alimentary tube, in which the agency of opium may be usefully invoked, with the view of removing constipation. This is often dependent upon irregular action of the nerves, distributed to the muscular fibres of the intestines,—a state, which a combination of opium with some cathartic—as with calomel—is well calculated to remove. The opium allays the inordinate action of the nerves,—resolves the spasm,—and permits the calomel to exert its ordinary cathartic agency. For reasons like these, strengthened by the results of experience, a combination of calomel with opium, or with the sulphate, acetate, or muriate of morphine, is a common prescription in enteric inflammation,

with many practitioners. In most of the London hospitals, it may be regarded as an officinal formula.

It has been an interesting topic of inquiry;—how narcotics exert their constitutional effects:—that is, whether by the impression they make on the nerves of the part with which they come in contact—such impression being conveyed to the rest of the nervous system—or, whether they must not, in every case, enter the bloodvessels; affect the nerves distributed to the inner coat of the vessels; or pass with the current of the circulation to the great nervous centres. There are many facts, which may be adduced in favor of each of these views. As regards the first, one of the strongest arguments is the rapidity with which the effects of certain narcotics are produced. Of these, perhaps the most marked is an agent, which I classed amongst the sedatives, but which has been placed, by many toxicologists, amongst the narcotics. I allude to the hydrocyanic acid. The effects of this acid have been examined by numerous observers. Magendie asserts, that if a single drop be put into the throat of a dog, the animal makes two or three deep, hurried respirations, and instantly drops down dead; that it causes death almost as instantaneously, when dropped under the eyelid; and that when it is injected into the jugular vein, the animal falls dead at the very instant, as if struck with a cannon ball or with lightning. “In repeating these experiments,” says Dr. Christison,* “in order to determine, figuratively, the shortest period, which elapses before the poison begins to operate, as well as the shortest time in which it proves fatal,—two points, it will presently be found important to know,—I found that a single drop weighing scarcely a third of a grain, dropped into the mouth of a rabbit, killed it in 83 seconds, and began to act in 63 seconds,—that three drops, weighing four-fifths of a grain, in like manner killed a strong cat in thirty seconds, and began to act in ten,—that another was affected by the same dose in five, and died in forty seconds,—that four drops weighing a grain and a fifth did not affect a rabbit for twenty seconds, but killed it in ten seconds more,—and that twenty-five grains, corresponding with an ounce and a half of medicinal acid, began to act on a rabbit as soon as it was poured into its mouth, and killed it outright in ten seconds at farthest. Three drops, projected into the eye, acted on a cat in twenty seconds, and killed it in twenty more; and the same quantity, dropped on a fresh wound in the loins, acted in forty-five and proved fatal in a hundred and five seconds.”

* ‘A Treatise on Poisons,’ 2d edit. p. 657.

Again, the empyreumatic essential oil of tobacco has proved fatal in two minutes ; as well as the strychnine.

Now, in the case of the hydrocyanic acid especially, which proves fatal in a large dose, even before the animal can be removed from the lap of the experimenter, it seems difficult to invoke any other explanation, than that its effects are exerted upon the nervous radicles with which it is made to come in contact, and that thence, with the rapidity of lightning, the lethiferous influence is propagated to the brain, which dies first, and, in due succession, all the functions, under its presidency, cease to act. Dr. Christison, indeed, when treating of opium, affirms, that "the old doctrine, that the bloodvessels have no concern with its action, and that it acts only by the conveyance along the nerves of the peculiar local torpor arising from its direct application to their sentient extremities, has been long abandoned by most physiologists as untenable. But some have adopted a late modification of this doctrine, by supposing, that opium may act both by being carried with the blood to the brain, and by the transmission of the local torpor along the nerves. They believe, in fact, that opium possesses a double mode of action,—through sympathy, as well as through absorption." "It would be fruitless," he adds, "to enquire into the grounds, that exist for adopting or rejecting this doctrine, because sufficient facts are still wanting to decide the controversy. So far as they go, however, they appear adverse to the supposition of a conveyance of impressions along the nerves, without the previous entrance of the poison within the bloodvessels."

All the difficulties, in the way of the theory of the sympathetic action of opium, he thinks, are removed, by the doctrine of Messrs. Morgan and Addison. According to this, the experiments, which appear at first sight to prove, that opium operates by being carried with the blood to the part on which it acts, are easily explained by considering, that the opium makes a peculiar impression on the inside of the vessels, which impression subsequently passes along the nerves to the brain. In the case of the hydrocyanic acid, however, the imbibition must take place most rapidly, as the deadly results supervene so immediately on its application. Its penetrating power must largely exceed that of other narcotic agents, which require a long time before their effects are perceptible. Its action obviously can only be accounted for, by presuming, that its impression is made on the nerves, either of the part, or of the interior of the bloodvessels: there is not time for the poison to pass to the nervous centres.

with the circulatory current, and the experiment of Magendie—which shewed that death supervened on the very instant, when the acid was injected into the bloodvessels, whilst a few seconds elapsed before its fatal action, when it was put in contact with an absorbing surface—would favour the notion of Messrs. Morgan and Addison, that the lethiferous impression is made on the nerves distributed to the inner coat of the bloodvessels, although the difficulty remains, why these nervous filaments should be more impressible to poisons than the nervous radicles, distributed to the external dermoid or other tissues. If, however, the explanation of these gentlemen be the true one, such must be the fact, whatever may be the difficulty in suggesting a satisfactory explanation of the phenomenon.

It is proper to bear in mind, in this investigation, that many agents, of the class now under consideration, do produce impressions on the nerves of the part to which they may be applied, without the general system being materially implicated;—a circumstance, which would favour the views of those, who consider it indispensable, that poisons should enter the bloodvessels, in order that they may act on the general system. Robiquet remarked, that when the vapour of the concentrated hydrocyanic acid was confined for some time in a glass tube, with a finger on each open end, the point of each finger became benumbed, and remained so for more than a day. Dr. Wilson Philip found, that when opium was applied to the mucous coat of the intestines of a living rabbit, the muscular contractions of the gut were immediately paralyzed, without the general system being affected for some time. The same effect was observed by Messrs. Morgan and Addison, to follow the application of ticunas to the intestine. An instantaneous and total suspension of the peristole took place whenever the poison touched the gut. Dr. Monro, Secundus, found, when an infusion of opium was inserted between the skin and muscles of the leg of a frog, that the leg soon became paralyzed, while the animal was able to leap about briskly on the other three.*

Many similar examples of purely local impression might be mentioned, were it necessary. The singularity is, that the general system should, in these cases, remain intact. A striking instance of purely local action, and, at the same time, of that inexplicable preference, of which we have so many examples, in the influence exerted by various agents on the economy, is the effect

* Christison, *op. citat.* p. 5.

of some of the class of narcotics in dilating the pupil. This is done by the extracts of belladonna and stramonium, without the general nervous system being in the least implicated ; whilst the most energetic of the narcotics—opium—exhibits no such preference of action on these nerves.

There can be no doubt, then, that narcotics may affect the frame through the medium of the nerves, without its being necessary, that they should proceed, with the blood, to the great centres of the nervous system ; but there are strong facts to shew, that, in certain cases, they may be absorbed, and act through the medium of the circulation. Still, as Profesor Thomson suggests,* such absorption would seem to be by no means essential. The strongest arguments in favour of this view—as properly stated by that gentleman—are : *First*. The time that supervenes between taking a dose of opium and the manifestation of its influence on the system—a time sufficient, certainly, for the absorption of the narcotic ; but, in reply to this argument, he states, that the intimate combination of the meconate of morphia, with the other constituents of the drug, requires some time before it can be so far separated as to be able to act with energy on the sentient extremities of the nerves of the stomach : for “ we find,” he adds, “ that the time, which supervenes, is in the direct ratio of the state of solution and separation from the other constituents of the opium, in which the meconate exists in the preparation employed.” But this explanation is unsatisfactory. When taken in a soft pill, opium produces its effects almost as soon, as when any of its forms of preparation are administered. It has, indeed, been maintained, that this is not the fact,† but the very cases adduced are such as establish the affirmative of the position. In a case, related by M. Desruelles, the sopor was fairly formed in fifteen minutes, after two drachms of solid opium had been taken.

Secondly. The increase of the symptoms, for ten or twelve hours after their inception, although the opium is as much in contact with the nerves in the first quarter of an hour, as at the end of the twelve hours. This argument, Dr. Thomson observes, is more difficult to answer than the first, and, his opinion is, that it certainly indicates absorption. This is probable ; but, under any view, it is somewhat strange, that the augmentation should continue so long ; and the supporters of the doctrine—that the effect must take place through the medium of the nerves—might

* Op. citat. i. 535.

† Christison, op. cit. p. 618.

suggest, with much speciousness, that such effect is as easily explicable, or the idea of the reiteration of narcotic impressions, made by fresh and fresh portions of the narcotic coming in contact with the nerves distributed to the inner coat of the bloodvessels, as by the view, that the narcotic must pass, with the blood, to the nervous centres themselves.

Thirdly. The rapid effects, which follow the injection of opium, in solution, into the veins; and not opium only, but any of the narcotics. Orfila found, that an ounce of the extract of the leaves of the *conium maculatum* killed a dog in forty-five minutes. Ninety grains, inserted into a wound, killed another dog in an hour and a half: and twenty-eight grains, injected into a vein, killed another in two minutes.* It is, therefore, legitimately inferred, that these substances act by entering the bloodvessels: but even granting this, it does not follow—as I have shewn—that the substance must pass with the blood to the great nervous centres. It may act on the nerves of the inner coat of the veins. Indeed, the short time, that elapses, prior to the supervention of the narcotic effects, when the poison is injected into the bloodvessels, is somewhat unfavourable to the doctrine of the necessity of direct contact with the great centres of the nervous system.

But there are facts, which shew, incontrovertibly, that opium may enter into the fluid of the circulation. During the confinement of the lady of my friend Dr. George Gibson, of Baltimore, it was considered necessary to administer morphine to her. The infant became so completely narcotized, that serious apprehensions were entertained for its safety. It ultimately recovered. A similar case is given by Barbier. The infant was manifestly affected through the milk of the mother, who had taken a large dose of the wine of opium. In these instances, the narcotic must have passed into the circulation of the mother, and been separated from it by the *mammæ*. We are compelled, therefore, to admit, that opium may commingle with the blood in the vessels, and even if we do not allow that it proceeds to the great nervous centres,—there to exert its appropriate influence,—we can conceive, that by coming in contact with the nerves, distributed to the coats of their bloodvessels, it may produce a more powerful effect upon the nervous system, than if its action were wholly exerted on the inner coat of the vessel, into which it first passed.

* *Toxicologie générale*, ii. 303.

With these facts before us, it is impossible to arrive at any single exclusive deduction. It would seem, that narcotics may exert their effects upon the nerves of a part of the dermoid surface, and on the nerves distributed to the inner coats of the bloodvessels; and that they may pass into the current of the circulation, and proceed, with it, to exert what precise agency is not so clear.

Professor Thomson* has affirmed, that the nerves, more particularly affected by narcotics and sedatives, are the respiratory;—but I do not see how he attains this conclusion. He quotes, in confirmation of the opinion, a series of experiments, conducted by Sir Benjamin Brodie. That distinguished surgeon introduced, in one instance, a drop of the volatile oil of bitter almonds into a wound in a rabbit: after five minutes, respiration had ceased; but the heart “was still beating through the ribs;” and, by renewing and keeping up respiration, by artificial means, for sixteen minutes, spontaneous breathing was re-established; all the functions of the brain revived, and life was in fact restored. Dr. Thomson adds—“It is not easy to explain, why one set of nerves should be more particularly influenced than another by narcotics.” This case does not, however, appear to be in point. There is a marked difference between the animal and the organic nervous systems. The voluntary and mixed muscles are under the presidency of the former:—the involuntary, under that of the latter: the respiratory organs are mainly supplied by encephalic nerves: the heart more by the ganglionic. But the latter organ is singularly situated as regards the nerves. Although capable of being affected through them, its action may continue after the great nervous centres have been destroyed—provided it receives its ordinary stimulus, by the maintenance of artificial respiration.† When, however, the cerebro-spinal axis is destroyed, the mechanical phenomena of respiration necessarily cease.

In like manner, if the functions of the brain are suspended, by the action of a powerful narcotic, the respiratory phenomena, which are dependent upon the influence of the brain, are suspended also; and if the action of the narcotic be fleeting, we may conceive, that, by keeping up the mechanical phenomena of respiration, and thus maintaining the heart in action, as the influence of the narcotic passes away, the encephalon may re-

* Op. citat. i. p. 501.

† See the author's ‘Human Physiology,’ 1st ed. ii. 129, and 2d ed. ii. 144.

sume its wonted functions, and respiration be completely re-established. The experiments of Sir Benjamin Brodie should, therefore, be borne in mind; and although, in the case of narcotics, whose action is prolonged, no useful hint may be derived from them of a therapeutical nature, yet, as I have said before, where a narcotic has been taken, whose action is transitory, the recollection of them; and a due acquaintance with the physiological inferences deducible from them, might lead to the preservation of a life, which, otherwise, might have been lost.

Narcotics, then, may be used as excitants, or sedatives. Generally, they are employed to diminish impressibility, and to allay action; and a knowledge of their medicinal properties enables us to administer them even when high inflammatory action may be present. The case of severe headache, supervening on great loss of blood from the uterus, is one, which I before selected,* with the view of pointing out the difference, that may exist between hyperæmia of various kinds. I there remarked, that, a few hours after blood has been lost to an inordinate extent, by this, as well as by other hemorrhages, the nervous impressibility is irregularly developed, and, under the erethism of the nerves distributed to particular bloodvessels, these vessels assume augmented action, and evidences present themselves, in the circulatory movement, which appear to indicate the existence of vascular force and repletion.

I have before remarked, that, in all such pathological conditions, the indication cannot be, to draw more blood from a system almost exhausted of it,—exhausted, that is, as far as is compatible with the persistence of life: it must clearly be,—to allay that irritability of the nervous system, which has been so inordinately developed, and the best mode, to accomplish this, is, to administer a full sedative dose of opium; under the action of which, the nervous and vascular turmoil will rapidly subside into a state of quietude.

It is astonishing to what an extent narcotics may be borne with impunity, where a habit of resistance has been acquired, by long protracted indulgence. Dr. Russel, in his 'History of Aleppo,' states, that a Turk of the name of Mustapha Shatar—an opium eater in Smyrna—took, daily, three drachms or 180 grains of opium; and in the 'Confessions of an English Opium Eater,' the author is affirmed to have consumed, at one time,

* See page 397.

* Op. cit. i. 601,

eight thousand drops of laudanum, daily. If we consider, that 25 drops of laudanum are equal to one grain of opium, this would make 320 grains, or upwards of five drachms, in the day.

Besides the physical agents, classed under the head of narcotics, there are certain moral influences, which may be placed in the same division. These, Professor Thomson* has called 'mental narcotics,' and he has properly remarked, that "persons, who are endowed with great nervous sensibility, are for the most part powerfully affected by mental pleasures and pains; and, therefore, when the higher orders of society, and men of intellectual acquirements are affected by mental diseases, it is sometimes necessary to employ mental narcotics, when material substances fail in procuring repose." Perhaps, however, in all cases, such mental operations are wholly of a revellent kind; and sleep ensues by our diverting the mind from the trains of thought, or from impressions, which prevented it. Impressions, made upon the nerves of audition, have a soothing effect, more than those experienced by any of the other senses. It is thus, that music exerts so powerful an impression on the frame,—partly, perhaps, by the mere excitation of the auditory nerves, and partly, also, by the abstraction, which it induces, when selected so as to suit the precise feeling. Its effect upon the hearer has been beautifully depicted by Dryden, in his 'Alexander's Feast;' and, that the picture is not overdrawn must be admitted by all, who have heard the piece well read, with the 'action suited to the word,' and, indeed, on simple perusal, by every one, whose mind is attuned to the livelier sympathies.

If the musical air be lively, and varied, the attention may be kept on the alert, so that sleep may be dispelled; but if its character be 'most musical, most melancholy,' and, withal, more or less monotonous, sleep is almost sure to ensue. Armstrong—himself one of the profession—has well described the effects of music when he says:

"Music exalts each joy, allays each grief,
Expels diseases, softens every pain."¹⁷

But, it is not necessary, that the intellectual pleasure of music should be always experienced, when the object is to restore sleep to the sufferer, or to produce it in one, who is in health. Any succession of unvaried sounds can induce it;—as the bub-

* Op. cit. i. 601.

bling of a brook ; the purling of a rill ; the hum of a distant, busy multitude ; a discourse—however interesting—delivered in a drawling monotonous manner ; the clacking of a mill, &c. In like manner, the ballad of the nurse, with the rocking of the cradle, soothes the restless infant, and, with the same view, nurses are in the habit of scratching the child's back. Again, where a person cannot easily fall asleep, he is often recommended to count, over and over again, as far as fifty, and this expedient often succeeds. The mind is abstracted from the thoughts and reflections that occupy it, whilst the monotony of the occupation combines to accomplish the desired result. We can thus understand, why the gentle and continued friction, employed by the animal magnetizer should be soothing, and agreeable, and, when accompanied by the fixed regard, and the air of imposing mystery, which is always assumed by him, should divert the attention of the patient from his malady—if he be diseased—and induce sleep in all, but how the process should make sleepwalkers, and sleepwalkers, and still more, how it should enable them to be *cognoscenti* in difficult subjects of science and art, is neither explicable, nor credible.

It can readily be conceived, that, in many cases of insanity, appropriate music may exert a valuable therapeutical agency, but it requires the greatest caution on the part of the practitioner, in adapting it to particular cases. Lively music may abstract the melancholic from his corroding dejection ; whilst the more soothing has been known to produce the happiest effects on the furious maniac. In properly adapting it, it is important to know something of the history of the patient, lest associations of a painful character should be called up, which might vibrate to every part of the frame, and give rise to an increase of the aberration.

The inquiry, already entered into, respecting the properties of narcotics, as medicinal agents, will not demand that much should be said concerning their therapeutical application. Allaying pain ; producing sleep, and diminishing action, in large doses, it is only in such doses that their use can be properly invoked, where there is augmented vital activity. On the other hand, as they are excitant in small doses, they must be exhibited in such doses, where the object of the physician is to add to the amount of excitation.

In intermittent fevers, they are occasionally administered to stop an anticipated paroxysm: the effect is probably induced by the new action they occasion in the nervous system, which breaks in upon the morbid catenation that exists in these periodical affections.

In continued, and remittent fevers, when narcotics are considered to be indicated by extreme watchfulness and restlessness at an early period of those diseases, they should obviously be given in such quantities, that their sedative influence may be fully exerted; otherwise, the exaltation of the vital manifestations might be carried yet farther. I well recollect, at the period when I followed the clinical lectures of Dr. Home, at the Royal Infirmary of Edinburgh, but little hesitation existed as regarded the administration of opium, after the ninth day of a continued fever; not because the intelligent Professor conceived, that there was philosophy in the observance of days, but because it had appeared to him that prior to this period—that is, during the first week of the disease—the beneficial effects of the opiate were not as marked as they were afterwards. The ordinary dose, directed by Dr. Home, was thirty-five drops of the *tinctura opii*. Pursuing the plan, inculcated by him, I was in the habit—early in practice—of waiting until about the commencement of the second week, and then of prescribing this quantity, but, as I became better acquainted with the properties of the drug, and with the pathological conditions present in fever, I have not hesitated—in public and in private practice—to give it in larger doses, and even at an early period of the fever; and I am not prepared to say, that I have, in a solitary instance, observed any unpleasant results from its administration. I generally begin with 40 or 50 drops in the case of the adult, or with 15 or 20 drops of the black drop, or with one of the preparations of morphine, and am careless as to the precise day of the complaint, provided symptoms exist, which appear to me to indicate its use.

Of the employment of narcotics in the different phlegmasiæ, I have already spoken at so much length, that it is not necessary to say any thing farther. In the spasmi of Cullen, and some of the vesaniæ,—as the delirium tremens,—they are, at times, the only agents, that afford the slightest relief, and it is astonishing what quantities may be taken without the supervention of narcosis. In all such cases, they act as indirect agents belonging to the class of antispasmodics, overcoming the erethism,

or producing a new action, in the nervous system, and thus detracting from that, which may be localized in some part of it, and may be occasioning spasmodic action. But, it would be endless to attempt to point out every pathological state, in which the use of opiates may be indicated. The practitioner must judge for himself, and if he understands the nature of the morbid phenomena, and is well acquainted with the medicinal properties of his narcotic, he cannot fail to know, where its employment would be salutary or noxious. The object of this work is to attempt to lay down the great general principles of Therapeutics, and to avoid detail. Of the evils of too great detail we have, indeed, the most marked examples in some of the existing works on Therapeutics and Materia Medica, and it is utterly impossible for the student to rise from their perusal, with other feelings than those of confusion—inextricable confusion.

TABLE

OF THE CHIEF NARCOTICS, AND THEIR OFFICINAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
<p><i>Aconitum.</i> <i>Aconite.</i> <i>Wolfsbane.</i> <i>Monkshood.</i> (The leaves of the <i>Aconitum Neomontanum</i>, and <i>A. Napellus</i>. Active principle, <i>Aconitine</i>.</p>	<p>From Europe. Also cultivated in the United States.</p>	<p>..... gr. 4 to 8.</p> <p>Extractum Aconiti. (The inspissated juice.) } gr. $\frac{1}{8}$ to 2.</p>	
<p><i>Ætherea.</i> <i>Ethers.</i> (See Table of Excitants.)</p>		<p><i>Æther Sulphuricus</i>. f.dr. $\frac{1}{2}$ to f.dr.2.</p> <p><i>Sp. Ætheris. Sulphurici</i>. f.dr. $\frac{1}{2}$ to f. dr.3</p> <p><i>Sp. Ætheris. Sulphurici composi-</i> <i>tus.</i> } f.dr. $\frac{1}{2}$ to f. dr.3 <i>Hoffman's Anodyne Liquor.</i> }</p>	
<p><i>Belladonna.</i> <i>Deadly Nightshade.</i> (The leaves of the <i>Atropa Belladonna</i>.) Active principle, <i>Atropine</i>.</p>	<p>From Europe.</p>	<p>.....</p> <p>Extractum Belladonnæ. } gr. 1 or 2. (The inspissated juice.) }</p>	<p>gr. 1 or 2. The juice or extract is used to dilate the pupil.</p>
<p><i>Camphora.</i> [?] <i>Camphor.</i> (See Table of Excitants.)</p>	<p>.....</p>	<p>(See Table of Excitants).</p>	<p>gr. 5 to 10.</p>
<p><i>Conium.</i> <i>Cicuta.</i> <i>Hemlock.</i> (The leaves of the <i>Conium Maculatum</i>.) Active principle, <i>Conine</i>.</p>	<p>From Europe, and in this country.</p>	<p>.....</p> <p>Cataplasma Conii. (Fol. conii exsicc. oz. 1; aq. Oj. $\frac{1}{2}$. Boil to a pint; strain and add pulv. fol. conii enough to make a cataplasma. } Used in cases of painful ulcers.</p> <p>Extractum Conii. The inspissated juice. } gr. 3 to 5.</p> <p>Tinctura Conii. (Fol. conii exsicc. oz. 2; sem. coriand. contus. oz. 1; alcohol. dilut. Oj. } f.dr. $\frac{1}{2}$ to f.dr.1</p> <p>Unguentum Conii. (Fol. conii. recent.; adipis præpar. ana lb. 2. Boil the leaves in the lard, till they are crisp, and express through linen. } Applied to irritable ulcers, &c.</p>	

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE
Digitalis. <i>Foxglove.</i> (The leaves of the <i>Digitalis Purpurea.</i>) Active principle, <i>Digitaline.</i>	From Europe. Also, cultivated here.	.....	gr. 1 or 2.
		Infusum Digitalis. (Fol. Digital. exsicc. dr. 1; aq. bullient. O $\frac{1}{2}$; tinct. cinnam. f. oz. 1.)	f. oz. $\frac{1}{2}$.
		Tinctura Digitalis. (Fol. digital. exsicc. oz. 4; alcohol. dilut. O ij.)	m 10.
Humulus. <i>Hops.</i> (The strobiles of the <i>Humulus Lupulus.</i> Active principle, <i>Lupuline</i> :—see below.	.....	.....	gr. 3 to 20. Sometimes given in infusion; used as a pillow—and in a bag as a dry fomentation.
		Extractum Humuli. (Humul. oz. 4; aq. bullient. cong. Boil to O iv.; strain, and evaporate.)	gr. 10 to 30.
		Tinctura Humuli. (Humul. oz. 5; alcohol. dilut. Oij.)	f.dr. 1 to f.dr.3.
Hyoscyamus. <i>Henbane.</i> (The leaves of the <i>Hyoscyamus Niger.</i>)	Chiefly from Europe; but also in this country.	.....	gr. 5 to 10.
		Extractum Hyoscyami. (The inspissated juice.)	gr. 2 to 5.
		Tinctura Hyoscyami. (Fol. hyoscyam. exsicc. in pulv. oz. 4; alcohol. dilut. O 2.)	f. dr. 1.
Lactucarium. <i>Lactucarium.</i> (The concrete juice of the <i>Lactuca Sativa.</i>)	.....	.....	gr. 2 to 10.
Lupulina. <i>Lupuline.</i> (See Table of Excitants.)	.....	.....	gr. 6 to 12.
		Tinctura Lupulinæ. (See Table of Excitants.)	f.dr.1 or f.dr.2.
Morphina. Morphia. Morphine. (Precipitated from the Meconate of Morphine as it exists in opium—by ammonia or magnesia; then purified by the agency of alcohol, or by repeated solution in a dilute acid, and precipitation.	.....	.....	gr. $\frac{1}{8}$ to $\frac{1}{4}$. Rarely used, owing to its insolubility.
		Morphina Acetas. (Morphin. oz. 1; aq. distillat. O $\frac{1}{2}$; acid. acetic. q. s.—saturate; evaporate and dry.)	gr. $\frac{1}{8}$ to $\frac{1}{4}$.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
<p>Opium. <i>Opium.</i> (The concrete juice of the <i>Papaver Somniferum</i>.) Active principles,—<i>Morphine</i>, and <i>Narcotine</i>. Chiefly the former.</p>	<p>From Hindusthan, Persia, and Turkey, chiefly.</p>	<p>Morphinæ Sulphas. (Morphin. oz. 1; aq. distillat. O $\frac{1}{4}$; acid. sulph. dilut. q. s.—saturate, evaporate, and crystallize.)</p>	<p>gr. $\frac{1}{8}$ to $\frac{1}{4}$. The salts of morphine may also be used <i>endermically</i>:—three times the ordinary dose being sprinkled on a denuded surface.</p>
		<p>Liquor Morphinæ Sulphatis. (Morphin. sulph. gr. 8; aq. distil. lat. O $\frac{1}{4}$. Dissolve.)</p>	<p>f.dr. 1 to f.dr. 2. i. e. from gr. $\frac{1}{8}$ to gr. $\frac{1}{4}$ of the sulphate.</p>
		.....	gr. 1 to 3.
		<p>Confectio Opii. (Opii in pulv. dr. 6; pulv. aromat. oz. 6; pulv. trag. dr. 2; syrup O j.)</p>	<p>grs. 36 contain one grain of opium.</p>
		<p>Enema Opii. (Tinct. opii f. dr. 1; aquæ calid. f. oz. 6.)</p>	
		<p>Extractum Opii. (The watery extract.)</p>	<p>gr. 1 or 2.</p>
		<p>Pilulæ Opii. Pilulæ Saponis cum Opio. (Pulv. opii dr. 1; sapon. gr. 12; divide in pilulas 60.)</p>	<p>Each pill contains a grain of opium.</p>
		<p>Pulvis Cretæ compositus cum Opio. (Pulv. cretæ comp. oz. 6 $\frac{1}{2}$; opii duri scr. 4.)</p>	<p>Two scruples contain one gr. of opium.</p>
		<p>Pulvis Ipecacuanhæ et Opii. Pulvis Ipecacuanhæ compositus. <i>Dover's Powder.</i> (See Table of Diaphoretics.)</p>	<p>Ten grains contain one of opium.</p>
		<p>Pulvis Opiatus. Pulvis cornu usti cum opio. (Opii p. 1. cretæ ppt. p. 9.)</p>	<p>Ten grains contain one of opium.</p>
		<p>Tinctura Opii. <i>Laudanum.</i> (Opii in pulv. oz. 2 $\frac{1}{2}$; alcohol. dilut. O 2.)</p>	<p>15 minims, or about 25 drops are equal to 1 gr. of opium.</p>
		<p>Tinctura Opii Acetata. Acetum Opii. <i>Black Drop.</i> (Opii oz. 2; aceti f. oz. 12; alcohol. O $\frac{1}{4}$;—macerate and filter.)</p>	<p>Two or three times as strong as laudanum.</p>

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Papaveris Capsulæ. Poppy Capsules. Poppy Heads. (The mature capsules of the <i>Papaver Som- niferum</i> .)	}	Tinctura Opii Ammoniata. (Opii dr. 2; croci. acid. benzoici ana dr. 3; ol. anis. f. dr. $\frac{1}{2}$; al- cohol. ammoniat. f. oz. 16.)	f. dr. 1 contains about 1 grain of opium.
		Tinctura Opii Camphorata. Tinctura Camphoræ Composita. <i>Paragoric Elixir</i> . (Pulv. opii; acid benzoic. ol. anis. ana dr. 1; ext. glycyrr. oz. $\frac{1}{2}$; mel. despumat. oz. 2; camphor. scr. 2; alcohol. dilut. O ij.)	f. oz. $\frac{1}{2}$ contains rather less than a grain. f. dr. 1 to f. dr. 2.
		Trochisci Glycyrrhizæ et Opii. (Opii dr. 2; tinct. tolu f. oz. $\frac{1}{2}$; sy- rup. O $\frac{3}{4}$; ext. glycyrr., pulv.; g. arab. ana oz. 5. Divide into tro- ches, each weighiug 10 grains.)	Each troche contains about one-seventh of a grain of opi- um.
		Vinum Opii. (Opii oz. 2; cinnam. contus.; cary- oph. contus. ana dr. 1; vini O l.)	The same as the tinctura o- pii.
		.....	Used in decoction as an emol- lient and anodyne fomenta- tion.
		Decoctum Papaveris. (Papav. capsul. oz. 4; aq. O iv. Boil for a quarter of an hour, and strain.)	
		Extractum Papaveris. (Papav. capsul. lb. 1; aq. bullient. cong. Macerate for 24 hours; boil to O 4; strain and evaporate.)	gr. 5 to 10.
Stramonii Folia. Thorn apple leaves.	}	Syrupus Papaveris. (Capsul. papav. oz. 14; sacch. pur- rif. lb. 2; aq. bullient. cong. 2 $\frac{1}{2}$. Macerate the capsules in the wa- ter for 24 hours; boil to a gallon and express. Boil the liquor to O ij., and strain. Let the dregs subside; boil to O j., and add the sugar.)	f. oz. $\frac{1}{2}$ to f. oz. 1. One fluid ounce ought to be e- qual to about one grain of o- pium.
		.....	gr. 1 or 2.
		.....	gr. 1 or 2.
		.....	The juice or extract is used to dilate the pu- pil.
Stramonii Semina. Thorn apple seeds. (The leaves and seeds of the Jamestown weed—the <i>Datura Stramonium</i> .) Active principle, <i>Datu- rine</i> .	}	Extractum Stramonii. } (The watery extract.)	gr. 1.
		Unguentum Stramonii. (Fol. stramon. recent. lb. 1; adipis lb. 3; ceræ flavæ lb. $\frac{1}{2}$. Boil the leaves in the lard until they are friable; strain and add the melt- ed wax.)	Used in painful ulcers, hemor- rhoids, &c.
Mental Narcotics.			
(Appropriate music ; monotonous sounds ; or any succession of monotonous impres- sions.)			

SECTION III.

REFRIGERANTS.*

Definition of refrigerants.—Modus operandi—External and internal refrigerants—Refrigerant baths—Therapeutical application of refrigerants—In fevers—In the phlegmasiæ, &c.—Table of refrigerants.

REFRIGERANTS may be defined—"agents which diminish the morbid heat of the body."

In another work, I have entered at large into the interesting subject of the physiology of calorification,† and have there attempted to shew, that it is accomplished in every part of the system of nutrition—not exclusively in the lungs, as was at one time imagined. But, although not effected exclusively in those organs, the experiments of Le Gallois, as well as those instituted by M. Edwards, of Paris, have led the latter to infer, that there is always a certain ratio between heat and respiration in both cold blooded, and warm blooded animals; and in hibernating animals, both in the periods of torpidity and of full vital activity. When the eighth pair of nerves is cut, in the young of the mammalia, a considerable diminution is produced in the opening of the glottis, so that, in puppies, recently born, or one or two days old, so little air enters the lungs, that when the experiment is made in ordinary circumstances, the animal perishes as quickly as if it was entirely deprived of air. It lives about half an hour. But, if the same operation be performed upon puppies of the same age, benumbed with cold, they will live a whole day. In the first case,—M. Edwards thinks, and plausibly,—the small quantity of air is inadequate to counteract the effect of the heat; whilst, in the other, it is sufficient to prolong

* Temperants, Psyetica, from refrigero, 'I cool.'

† 'Human Physiology,' 1st edit. ii. 170, and 2d ed. ii. 187.

life considerably, and he deduces the following practical inferences, applicable to the adult age, and particularly to man.

“ A person is asphyxied by an excessive quantity of carbonic acid in the air which he breathes ; the beating of the pulse is no longer sensible, the respiratory movements are not seen ; his temperature is, however, still elevated. How should we act to recal life ? Although the action of the respiratory organs is no longer visible, all communication with the air is not cut off.—The air is in contact with the skin, upon which it exerts a vivifying influence ; it is also in contact with the lungs, in which it is renewed by the agitation which is constantly taking place in the atmosphere, and by the heat of the body, which rarefies it. The heart continues to beat, and maintains a certain degree of circulation, although not perceptible by the pulse. The temperature of the body is too high to allow the feeble respiration to produce upon the system all the effect of which it is susceptible. The temperature must then be reduced ; the patient must be withdrawn from the deleterious atmosphere ; stripped of his clothes, that the air may have a more extended action upon his skin ; exposed to the cold, although it be winter, and cold water thrown upon his face, until the respiratory movements reappear. This is precisely the treatment adopted in practice to revive an individual in a state of asphyxia. If, instead of cold, continued warmth were to be applied, it would be one of the most effectual means of extinguishing life. This consequence, like the former, is confirmed by experience. In sudden faintings, when the pulse is weak or imperceptible, the action of the respiratory organs diminished, and sensation and voluntary motion suspended, persons the most ignorant of medicine are aware, that means of refrigeration must be employed, such as exposure to air, ventilation, and sprinkling with cold water. The efficacy of this plan of treatment is explained on the principle before laid down. Likewise, in violent attacks of asthma, when the extent of respiration is so reduced that the patient experiences suffocation, he courts the cold even in the most severe weather ; he opens the windows ; breathes a frosty air, and finds himself relieved.”*

If the function of calorification had been wholly accomplished by the lungs, our refrigerants must have been applied to these organs to exert their full effect : but, as the ‘ secretion of heat ’—to use an expression of Dr. Wilson Philip’s—takes place in the capillary system of every part of the body, these agents are

* Op. citat. p. 149. See, also, the article *Asphyxia*, in the ‘ American Cyclopaedia of practical medicine.’

made to impress a portion of that system, whence the impression is conveyed to every part, by virtue of that extensive sympathy which is known to exist between every portion of the capillary system. Of the extent of this sympathy, both in its therapeutical and pathological relations, I have repeatedly had occasion to make mention. In the healthy state of the frame, it is evinced by the morbific influence of cold and moisture, when applied even to a small portion of the cutaneous surface, which has been previously shielded from their action. If a healthy person exposes his feet to these agencies, the capillary function becomes modified, and there is not a part of the capillary system, which does not feel the effects; but disease is not induced in the whole, unless it is, at the time, predisposed to assume the morbid condition. Generally, it happens, that there is some portion of the capillaries more disposed, at the time, to take on a diseased state than another, and under the irradiations that occur, owing to the modified action of the capillaries of the feet, disease in some organ results. Now, a similar action takes place, when we apply cold and moisture therapeutically. This we do in febrile affections, whenever the skin is steadily hot and dry, and we find that it is not necessary, that these agents should be applied over the whole of the cutaneous surface: it is but requisite, that they should be applied over a comparatively small portion,—as over the hands and arms. The sedative influence of the cold is exerted upon the capillaries with which it is made to come in contact; the function of calorification has its activity diminished; and, soon afterwards, we discover that the heat of the whole system has been manifestly lowered by the topical application.

The temperature of the human body is rarely raised beyond 106° of Fahrenheit's scale. Professor James Gregory, of the University of Edinburgh, was wont to say, that he doubted the accuracy of any thermometer, when a higher temperature, under the tongue, or in the axilla, was indicated. There can be no doubt, that the degree, at which Fahrenheit has placed 'Fever-heat' on his scale, is too elevated. There may be cases in which it has reached that point, but the ordinary temperature of the blood in fever is far below this.* M. Edwards alludes, in his work on 'Physical Agents,' to a case of tetanus, communicated to him by M. Prévost, of Geneva, in which the temperature rose to $110^{\circ}.75$ Fahrenheit.

To reduce this excessive heat, external agents, of a suitable

* In one of the hottest remittent fevers, which I have lately attended, it never rose higher than 102° , under the tongue.

temperature, are most effectual. Damp cold—of all external means of refrigeration—tends best to diminish the activity with which heat is developed. Hence its value as a refrigerant in fevers,—a point now universally acknowledged. But, if damp cold cannot be sufficiently prolonged, sponging, with water of any temperature below that of the body, occasions a more abundant evaporation, and a salutary refrigeration, the effect of which is extended to every part of the frame, in the manner I have mentioned.

Cool air is, likewise, a valuable refrigerant; and its admission, in febrile affections, is generally most grateful and salutary. There was a time when it was altogether excluded: when the temperature of the chamber was kept elevated, and hot fluids were administered, with the view of concocting or maturing some fancied peccant humour, and aiding its expulsion from the body. Since the time of Sydenham more especially, these absurd notions have passed away,—although we can yet discover some relics of their existence,—and, fortunately for the patient, the instinctive desire for cold drinks is now no longer opposed. Indeed, the use of cold fluids internally, and the free admission of cool air into the apartment, when the weather and the feelings of the patient will admit of it, may be looked upon as amongst the most important elements of our management of febrile cases.

When the ventilation of an apartment is properly attended to, the quantity of febrile heat is diminished,—both by the contact of fresh portions of cool air, and by the increased evaporation, which necessarily results.

When cold fluids are taken into the stomach, they produce an effect there, analogous to what occurs when they are brought in contact with a portion of the cutaneous surface. They are, indeed, the best refrigerants of the internal kind; and, of these, cold water—ice cold—or iced lemonade, may be regarded as the best. Every one must have observed, how rapidly and copiously the perspiration breaks out over the surface of the body, during the heats of summer, after a glass of cold water has been taken. This must be owing to the refrigerant influence of the low temperature reducing the erethism, which exists in the mucous membrane of the stomach, as it does in every part of the dermoid surface, whenever the temperature is extremely elevated. By reducing the erethism of the mucous membrane to the healthy standard, the sedative influence is propagated at once to every portion of the capillary surface, and the cutaneous transpiration is augmented by the diminution of the exalted actions of the

cutaneous exhalants. This is the only mode, in which the phenomenon can be rationally explained. It is impossible for us to admit, that the fluid can pass by imbibition so rapidly into the vessels as to account for it. The perspiration, in such cases, breaks out almost instantaneously after the fluid has reached the stomach, and impressed the lining membrane.

Writers on the *Materia Medica* have admitted—besides those refrigerants to which I have alluded—a number of agents, whose operation is much less unequivocal. “There are,” says Dr. Paris, “certain saline substances, which, by undergoing a rapid solution, and acquiring an increased capacity for caloric, produce a diminution of temperature, and if this takes place in the stomach, the sensation of cold, which it produces, is equivalent to a partial abstraction of stimulus; this being extended by sympathy to the heart occasions a transient reduction in the force of the circulation, and by this, or by a similar sympathetic affection, causes a sensation of cold over the whole body.”*

It is obvious, however, that such substances, according to this theory, can be refrigerant only, whilst undergoing a rapid solution, and that therefore, to produce their full effect, they should be given, either so as to undergo their solution wholly or partly in the stomach, or immediately after they are dissolved. Yet how trivial must be the operation of cold thus produced, compared with that which can be accomplished in fevers by a draught of iced water, and, accordingly, as I before remarked, iced drinks may be regarded as amongst our *febrifuga magna*—our most important refrigerants; and they are now employed, greatly to the exclusion of the nitrate of potassa, the biborate of soda, &c., &c., on which reliance was at one time placed.

There is a circumstance, by the way, connected with the use of these refrigerant salts, which is full of interest to the therapist, and exhibits that wandering from the true track, of which philosophy has to deplore the existence of so many examples, in the history of medical science. I have remarked, that internal refrigerants have been made to comprise—in many definitions—saline substances, which, by undergoing a rapid solution, produce a diminution of temperature in the stomach or elsewhere; and the definitions have been so worded, and intended, as to include such substances only. Yet, strange to say, the attention of the Therapist has strayed from the circumstances, that occasion such substances to be refrigerant, and we often observe a mixture,

* ‘Pharmacologia,’ Edit. cit. p. 113.

containing the nitrate of potassa in solution, directed to be administered at intervals throughout the day. In this mode of administration, the whole refrigerant effect must necessarily be lost. The mixture must attain the temperature of the chamber; and, if the nitrate of potassa produce any effect, it must be of an excitant character. The practitioner, notwithstanding, places great reliance, perhaps, on his febrifuge mixture; and this at least is fortunate, for whilst he is administering it, he is not as likely to be officiously irritating the intestinal canal, by repeated cathartics. In this way, the use of the inert compound may be followed by positive advantage.

The length to which I have gone, in another work,* on the effects of bathing, hygienically considered, renders it unnecessary to say much as to its therapeutical application. There is obviously a marked difference—and this ought never to be lost sight of—between the effects of a bath some degrees lower than the temperature of the body, and those of one that approaches or exceeds it. Whilst the former is markedly refrigerant; the other, as we have before seen, is powerfully excitant. They are adapted, consequently, for very opposite affections.

A difference, again, exists, between immersion or affusion, and ablution,—the former being attended with a shock or powerful impression on the nervous system, whilst the latter is devoid of it. When, therefore, we wish to diminish febrile heat, we prefer the ablution, or sponging of a part of the capillary surface, as of the upper or lower extremities, to general baths, affusion, or any variety of the douche; but if our object be to excite a revulsive effect,—to break in upon a morbid chain,—as to cut short a fever—then we choose, by preference, the form of application, which produces the greatest shock, or, in other words, the most marked impression upon the nervous system. Almost the only form of the bath, which is now employed, in febrile cases, is simple ablution, and the warm pediluvium or footbath. It might seem, that, in these very cases, a more powerful refrigerant influence would be exerted by the cold pediluvium, and, as regards the mere abstraction of caloric, this would doubtless be the case; but the impression made upon the nervous system is so considerable, when we first immerse our feet in a cold fluid, that the cold pediluvium becomes liable to the same objections as the cold affusion or the cold douche, when employed with simple refrigerant views. On the other hand, the warm pediluvium

*Elements of Hygiene, p. 406.

is devoid of those objections, whilst the ultimate refrigerant effects are scarcely perhaps less.

In addition to the internal refrigerants, which come under the definition of Dr. Paris, certain others have been enumerated, which are presumed to exert a temperant effect,—independently of the simple abstraction of heat. Thus, acetic acid, it is said, when properly diluted, renders the pulse, in a febrile state of the habit, slower; the animal temperature less, and improves the secretions. The same has been observed of all the vegetable acids, as well as of the baborate of soda, and the boracic acid; but there does not appear to be any strong evidence in favor of their possessing this property. Acids and subacids are always grateful in febrile affections, and by proving agreeable to the palate they may tend to allay irritation, but this applies equally to the mineral acids; and, accordingly, mineral lemonades are often beneficially prescribed in continental Europe. Dr. Thomson, however, excludes them, although he classes amongst the refrigerants—the acetic, oxalic, citric, tartaric, and malic acids.

As to the baborate of soda, and the boracic acid—although the latter was at one time termed the ‘*sal sedativus Hombergi*’—it is unnecessary to say much. Common consent has led to their total exclusion from the catalogue of internal refrigerants, in this country and in Great Britain, although they are still prescribed in some parts of Germany, whose pharmacopœias exhibit too many relics of prejudices, and irrational practices, prevalent in times, which, in other countries, have long passed away.

With respect to the therapeutical application of refrigerants, much need not be said. They are obviously proper, whenever the vital manifestations are exalted beyond the healthy standard: yet they may not all be equally appropriate; and the practitioner has to consider, whether there may not be other influences exerted by them, independently of the mere abstraction of heat;—whether, in other words, their refrigerant operation is simple, or combined with some other, that may modify their action on the economy.

This is well exemplified, in the cases of the cold affusion and cold ablution, when employed at the commencement of fever, with a view of arresting its course. Whilst the former may be fully successful, the latter may totally fail. The object is here, to excite a new impression on the totality of the nervous system, as well as to diminish the febrile action; and, accordingly, that form of applying the cold medium ought to be selected,

which communicates a powerful shock, and thus breaks in upon the morbid chain, which constitutes the disease. Now, as the simple sponging of the hands and arms with cold water communicates no such shock, it is manifestly not calculated to cut short fever; whilst on the other hand, the cold affusion becomes inappropriate, whenever the morbid phenomena, constituting continued fever, have persisted so long, that all hope of cutting the disease short has vanished, and when any powerful impression is likely to give rise to irregular action, and, therefore, to hyperæmia in some internal organ. In these cases it is, that cold, tepid, or even warm ablution is employed so advantageously, tempering the organic actions of the part to which it is directed, and thence extending its benign influence to every part of the organism.

The great rule for the use of external and internal refrigerants in fever is, to observe, whether the skin be steadily hot and dry. If so, cold ablution may be practised; cool air be admitted; the quantity of bedclothes be diminished, and cold fluids be freely indulged in; but whether all, or any, of these, may be applicable to particular cases, has to be left altogether to the discrimination of the practitioner.

In the different stages of the paroxysm of an intermittent, we have conditions present, which modify materially the employment of agents belonging to the class we are considering. In the cold stage, the hot stage, and the sweating stage, we are guided by rules, which are applicable to similar conditions, occurring in other morbid states. In the cold stage, the functions are oppressed and depressed, and there is more or less congestion internally: this is dependent upon modified innervation; such modification consisting in diminished action: fluids, therefore, which are of a temperature equal to, and above, that of the body, are needed to excite the nervous and vascular systems to a proper play of the functions; as soon as this has been accomplished, and reaction has taken place, general excitement is substituted for the previous state of diminished action, and we have every mark of synochal or inflammatory fever. Cold drinks now become most grateful and appropriate. They reduce the exalted actions and hasten the supervention of the sweating stage—a stage during which the heat is undergoing resolution, and in which cold drinks are, consequently, not advisable: tepid drinks may, therefore, be substituted.

That, which applies to cold drinks, during the paroxysm of an

intermittent, applies equally to the admission of cool air, and the regulation of the coverings of the patient. In the cold stage, warmth is advisable; in the hot, the whole system of refrigeration may be adopted; whilst, in the sweating stage, care must be taken lest the cutaneous capillaries be morbidly impressed, so as to excite irregular action in some important part of the organism, and consequent hyperæmic, or other, mischief.

I have already alluded to the prejudice, at one time universally prevalent, against the use of cold drinks in fever. This prevailed as long as, and even longer than, the doctrine of concoction, which taught, that a certain amount of febrile heat was necessary to mature a peccant matter, which must be got rid of, before the fever could yield. Fortunately for the patient, the prejudice is now daily yielding, and we rarely meet with it except amongst those whose minds have not been enlightened by the more modern, and more correct views of therapeutists. I have likewise referred to a similar prejudice, as regards the use of iced drinks, when calomel has been given. The prejudice is extremely unfortunate, as it often causes the denial of the very best febrifuge we possess, and suggests an opposite plan of treatment, which can scarcely fail to aggravate the disease. Were the idea, indeed, well founded, it ought to suggest a question, whether the calomel or the iced water should give place; and no doubt, I fancy, ought to exist in the mind of the reflecting practitioner, that the former, in most cases, should yield. To this decision he may be universally led, with propriety, where the calomel is given as a simple cathartic. The lists of the *materia medica* contain such a variety of those agents, that sufficient room is left for selection. Where, also, the mercury is administered as a revellent in fever—to produce a new action in the system—cold water, in moderation, may be permitted with impunity, and even with advantage. I have been, for years, in the habit of administering mercurial cathartics, and mercurial revellents in fever; and have never wholly restricted the patient from the use of ice; yet, in no case, have I seen the slightest inconvenience, occasioned by the combination. The notion of detriment from this course is now mainly abandoned by the physician; but it still clings, with pertinacity, to the extra-professional.

In fevers, that are accompanied with eruptions, the cooling regimen is not less important than in the simple continued, or remittent varieties. There was a time, when the eruption of small-

pox and of scarlatina was supposed to be injuriously checked by the free admission of cool air; but it is now acknowledged, that the use of refrigerants is attended with better effects than that of any other class of medicinal agents; and, in the generality of cases, the efforts of the intelligent physician are confined to the admission of cool air; sponging the body with cold or tepid water—especially during the eruptive fever—and the use of cold water internally; keeping the alimentary canal clear, at the same time, by the employment of gentle cathartics. I have elsewhere alluded to the peculiar character of scarlatina, and to the fact, that, although the organs of calorification—which consist of arterial capillary, and nervous ramification—are inordinately excited—yet, that it is an excitement originally more nervous than vascular—and, that copious bloodletting, instead of mitigating, too often adds to, its violence. In all cases, however—except perhaps in the most malignant typhoid forms—the application of cold to the surface, either by means of cold water or cool air, or both, may be advantageously invoked. Where such agency is improper, the fact will be indicated by the feelings of the patient. He will be rendered chilly, and the powers of the system will be manifestly depressed by it; but there are few cases in which the admission of fresh air will not be grateful and salutary.

It has been conceived, that cold sponging, and the other external refrigerants, are not as serviceable, where hyperæmia exists in some internal organ, as where the case is uncomplicated. This is true; but it by no means follows, that they should do harm. In certain internal inflammations, indeed, we are in the habit of employing them freely as remedial agents, and I think—and it is generally so thought—with advantage. In inflammations of the encephalon—primary, or occurring in the course of fever—the practitioner does not hesitate to have the head shaved, and to apply ice freely to it. “In no disease,” says Dr. Thomson,* “does the powerful sedative influence it possesses display itself so conspicuously as in phrenitis. The most furious delirium is quickly subdued by allowing cold water to drop on the vertex, whilst the rest of the scalp is covered with cloths moistened with vinegar and water.” Much, however, of the effect, in this case, is revellent rather than refrigerant. I have before attempted to shew, that every form of the cold douche produces its chief influence by the nervous abstraction it occasions; and not only is this the case in the ordinary hyperæmiæ,

* Op. citat. i. 493

constituting inflammations, but in those of an analogous nature, that constitute hemorrhages. The cold key, applied to the nape of the neck in epistaxis, produces its effect in arresting the hemorrhage, less by refrigeration than by revulsion. In active hemorrhages, however, the refrigerant effect of cold is a most valuable agency; and, where ice can be procured, it may be adopted internally, without the inconvenience that might result from the too free use of cold water internally. I have said, that where hemorrhage of this kind takes place, absorption is more active; and, if fluid be largely allowed, it soaks readily through the coats of the bloodvessels, so that in a short space of time there may be the same quantity of blood circulating in the vessels as before the hemorrhagic attack; and, as the blood is rendered more watery, a recurrence of the flow happens more easily. But, by taking a small piece of ice into the mouth, the full refrigerant influence is exerted, whilst there is no danger whatever of much imbibition, and consequent repletion of vessels.

Of the utility of cold applications as astringents, I have before spoken, particularly as concerns their use in hemorrhages. Whenever, indeed, it is necessary to produce a diminution in the amount of fluid in the capillary vessels of a part, their employment is indicated; and hence, in topical inflammations, strangulated hernia, &c., they are much employed. In the first of these affections, they act much in the same manner as hot applications. Both cold and heat occasion diminished calibre of the capillary vessels, and both are compelled, in many cases, to give place to the soothing influence of warmth—in cases, for example, where the activity of vessels predominates over the asthenic distension.*

In diseases of the respiratory organs, which interfere with the due aëration of the blood in the lungs, the exposure of the body to cool air—under precautions to be suggested by the individual case—is a useful agent; and its propriety is indicated by the instinctive desire which is felt for the free admission of air under such circumstances. The function of hæmatisation is not confined to the lungs, although chiefly accomplished there. It takes place, but to a slight extent only, over the whole cutaneous surface; and I have before alluded to the marked connection, that exists between the functions of calorification and respiration, so that if the latter be impeded, it is requisite that the former should be reduced likewise.

* See page 22.

It is unnecessary to dwell on all the cases in which refrigerants may be needed. The reflecting practitioner will easily understand those, in which they may be demanded; and, in this, he is fortunately guided, in most instances, by the sensations of the patient. Where the abstraction of heat is attended with disagreeable sensations, it can rarely, if ever, be proper: even in fevers, where the employment of these agents is most clearly indicated, we are greatly guided by the feelings of the sick; and if the free admission of cool air, cold ablution, and cold drinks excite chilliness, or any uncomfortable feeling, we regulate their application accordingly.

TABLE

OF THE CHIEF REFRIGERANTS, AND THEIR OFFICINAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE
<p>Potassæ Nitras.[?] <i>Nitrate of Potassa.</i> <i>Nitre—Saltpetre.</i> (See Table of Diuretics.</p>	<p>.....</p>	<p>Often prescribed in the form of what is called <i>Nitrous powder</i>. (Potass. nitr. gr 8 vel 10; antimonii et potass. tart. gr. $\frac{1}{5}$; hyd. submur. gr. $\frac{1}{4}$ to $\frac{1}{2}$.)</p> <p>Trochisci Nitratis Potassæ. <i>Troches of Nitrate of Potassa.</i> (Potass. nitr. p. 1; sacch. purif. p. 3; mucilag. tragacanth q. s.)</p>	<p>gr. 5 to 15.</p> <p>The whole powder.</p>
<p>Sodæ Boras.(?) <i>Sodæ Subboras.</i> <i>Borate of Soda.</i> <i>Borax.</i></p>	<p>From Thibet and Persia; found also in places in Europe, and in Peru.</p>	<p>Neither this, nor the <i>Boracic acid</i>,—formerly called the <i>Sal sedativus Hombergi</i>, is now much used internally, as a refrigerant.</p> <p>Mel Boracis. <i>Honey of Borax.</i> (Sodæ borat. dr. 1; mel despumat. oz. 1.)</p>	<p>Used chiefly in sore mouth.</p>
<p>Abstraction of Caloric. <i>Cold.</i></p>	<p>.....</p>	<p>1. INTERNALLY.</p> <p>Ice and iced drinks.</p> <p>Cold water.</p> <p>Lemonades made with both the vegetable and mineral acids.</p> <p>Soda water,—real and factitious. (The latter may be made by dissolving 25 grains of <i>tartaric acid</i> in water; and 30 grains of <i>carbonate of soda</i>; adding the two together, and drinking in a state of effervescence.) Powders, thus formed, are called <i>Soda powders</i>. (The <i>Seidlitz powders</i> are made like the <i>Soda powders</i>,—adding a drachm or two of the <i>tartrate of potassa</i> and <i>soda</i> to the <i>carbonate of soda</i>.)</p>	

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
(Abstraction of Caloric. <i>Cold.</i> Continued.	<p>Effervescing draughts are also made with the <i>citric</i> or <i>tartaric acid</i>, and with <i>lemon juice</i>. (Succ. limon. oz. $\frac{1}{4}$; sodæ carb. dr. $\frac{1}{2}$, vel potassæ carb. gr. 25.) The <i>Saline Mixture</i> is a composition of this kind—given either in effervescence, or after effervescence has passed away.</p>	
		2. EXTERNALLY.	
		<p>Cool air.—The warm bath (temp. 90°); the tepid, (temp. 75 to 90°); and the cold, (temp. 32 to 60°.) Cold, tepid and warm affusion and ablation.</p>	
		<p>Cold—ice-cold, evaporating and frigorific lotions.</p>	
		<p>Evaporating lotions may be made of ethereal or spirituous substances.</p>	
		<p>Frigorific Mixtures. (Ammon. muriat.; potassæ nitrat. ana p. 5; aq. p. 16.) Depresses the temp. from 50° to 10°.</p>	
		<p>Ammonia muriat., potassæ nitrat. ana p. 5; sodæ sulph. p. 8; aq. p. 16. Depresses from 50° to 4°.</p>	
		<p>(Ammon. nitr.; aquæ ana p. 1.) Depresses from 50° to 4°.</p>	
		<p>(Ammon. nitr.; sodæ carb.; aquæ ana p. 1.) Depresses from 50° to 7°.</p>	
		<p>(Sodæ sulph. p. 3; acid. nitr. dil. p. 2.) Depresses from 50° to 3°.</p>	
		<p>(Sodæ phosphat. p. 9; acid. nitr. dilut. p. 4.) Depresses from 50° to 12°.</p>	
		<p>(Sodæ sulph. p. 8; acid. muriat. p. 5.) Depresses from 50° to 0°.</p>	
		<p>Sodæ sulph. p. 5; acid sulph.; aq. ana p. 2.) Depresses from 50° to 3°.</p>	

SECTION IV.

NAUSEANTS.

Definition of nauseants—Condition of the functions during nausea—Modus operandi of nauseants—Use of in fevers ; in the phlegmasiæ, &c.—Their employment by the surgeon—Table of nauseants.

I HAVE separated nauseants from emetics, for the reasons stated in the section in which the modus operandi of the latter class of remedial agents is examined. Of the propriety of such a separation there can be no doubt, when we consider the marked difference between the states of nausea and vomiting; and that nauseants are frequently employed, when emetics are not thought to be indicated, and conversely.

If we administer any of the ordinary nauseant emetic substances, to the requisite extent, we find, that the patient complains of an indescribable sensation, which is chiefly referred to the epigastric region, but extends likewise to the head: a copious flow of the saliva, and of the cutaneous transpiration takes place, with paleness of the surface, and every mark of diminished innervation and circulation. The state of nausea is, consequently, one of reduced action; and it can be readily understood, that a sedative agency, thus induced, and kept up for a sufficient length of time, may succeed in overcoming inflammatory mischief, and in breaking in upon the morbid exaltation of actions, which constitutes ordinary fever. Now, these effects can be accomplished by nauseating remedies, appropriately administered; and hence the propriety of a class of Nauseants; and of their being ranged amongst those agents, which diminish action.

From this brief description of the effects, which nauseants are capable of inducing, their therapeutical application is sufficiently obvious, and, accordingly, but little difficulty is experienced by the practitioner, in laying down his indication, or in carrying it into effect, by some one or more of the numerous nauseants, which are contained in the catalogues of the *materia medica*.

With regard to the condition of the functions under the influence of a nauseant,—when pushed to the extent of inducing marked nausea,—there can be no difference of opinion; but it has been a question, whether, if these same agents be given so as to fall short of inducing nausea, or any sensible evidences of their action,—in alterative doses, in other words,—they may not modify the functions in the same manner as nauseants, but to a less degree.

A great deal may be said in favour of the affirmative view of this question, but it is one obviously difficult of demonstration. If, indeed, we were to deny the position altogether, it would be difficult to account satisfactorily for the operation of antimonials, or of many other reputed diaphoretics in small doses, which are emetic in larger. All admit, that when the tartrate of antimony and potassa is given so as to produce nausea, it is a decided sedative and diaphoretic,—diaphoretic because it is sedative. The state of nausea being, as I have said, one of diminished action,—the exalted vital manifestations, constituting fever, are reduced by it; and diaphoresis, which had been checked by the febrile irritation, is restored. In this case, the antimonial,—like every diaphoretic,—is an indirect agent only. But if the tartrate of antimony and potassa be given in doses somewhat smaller than are requisite to induce nausea, we can still conceive, that an action of sedation may be exerted, although, it must be confessed, we have no sensible evidence of such an effect except the result; and, it must be equally confessed, that, in our uncertainty, we ought scarcely to place that confidence in our agents, which is occasionally reposed in them by practitioners. Fortunately, however,—as I remarked under another section, in regard to antimonials especially,—this very confidence is, at times, followed by negatively beneficial results. It prevents the partisans of the perturbing treatment of fever, by means of violent and repeated cathartics, from causing as much irritation as they might otherwise do, and gives the patient a little of that quietude and absence from disturbance, which is so important in the management of all febrile cases, and especially of such as

are accompanied with erethism in the mucous membrane of the intestines.

In all internal inflammations, nauseants are obviously proper, as well as in every kind of active hemorrhage; whenever, indeed, it is desirable to diminish the force and velocity of the circulatory movements. In such cases, they are amongst our most valuable therapeutical means, and, if the system can be kept, for any length of time, sufficiently under their influence, the local hyperæmia will often yield, after it has resisted other agencies. In a case of pericarditis, which fell under my care some time ago, and which threatened fatal results, the acetate of morphine was administered in a full sedative dose;—this salt being preferred to opium in consequence of the latter disagreeing in the particular case. The nausea, caused by it, was intense; but the symptoms were so much ameliorated, that the dose was repeated: in this way, the nausea was kept up for forty-eight hours, and, during this condition, the inflammatory signs disappeared, and the patient doubtless owed her safety mainly to the nauseant agency.

In constipation, a union of nauseants with cathartics becomes occasionally advisable, and at times effectual, after cathartics alone have been unsuccessfully employed. If the constipation be dependent upon any irritated condition of the exhalants of the canal, the use of debilitants,—such as those we are considering,—reduces the erethism, and facilitates the operation of the purgative. Whenever, too, it is desirable to break in upon any morbid catenation, and especially in the neuroses, nauseants may be beneficially administered: but, in these cases, the revulsion, induced by a nauseating emetic, is generally preferred, in consequence of the more powerful impression which it makes on the nervous system. This subject has, however, been fully entered into, under the sections devoted to ‘Emetics,’ and to ‘Revellents,’ respectively. The practitioner has, in all cases, to reflect, whether the state of the organic actions is such as to require the debilitant agency, which nauseants are capable of exerting, and it is not generally difficult to arrive at a correct conclusion. Perhaps, in all cases, the tartrate of antimony and potassa can fulfil every desire of the physician; but, occasionally, other articles are selected:—the ipecacuanha by some: the squill—particularly when the affection is seated in the air passages—by others; but I do not know, that any nauseant is pre-

ferable to the tartrate of antimony and potassa; whilst—being devoid of any stimulating property—it can be administered in many hyperæmic cases, in which the exciting emetics would be obviously improper.

With similar views to those that impress the physician, the surgeon has recourse to nauseants. Whenever it is desirable to depress the energies of the system, and to induce relaxation of constricted parts, they are advantageously employed. In strangulated hernia, tobacco smoke, or a tobacco infusion is thrown into the rectum, but, as I have before remarked, the use of tobacco, even in this form, is not devoid of danger, and, perhaps, there is no relaxant effect produced by it, which might not be equally produced by the nauseants which I have especially recommended.

When a luxated limb has to be reduced, the force of contraction of the muscles is diminished, during the existence of nausea; and, if the surgeon employ his *manœuvres* dexterously, he may succeed in effecting the reduction.

To the obstetrical practitioner nauseants are no less useful. When the tartar emetic is given so as to impress the system, it removes rigidity of the os uteri; and, in violent or irritable labour, the inordinate activity of the uterus is allayed by it, whilst the dilatation of the mouth of the organ is facilitated. Dr. Kennedy, master of the lying in hospital, Dublin,* has recently drawn the attention of practitioners to these cases, as well as to the value of nauseants in puerperal convulsions, obstructed and inflamed mammæ, and in puerperal mania; but it is needless to attempt to point out every affection, in which nauseants may be employed with advantage. By bearing in mind the sedative influence they are capable of exerting, the practitioner can meet with little difficulty in deciding upon the cases in which their exhibition may be noxious or salutary.

* ‘American Journal of the Medical Sciences,’ No. 34. for Feb. 1836.

[For Table of Nauseants and their Officinal Preparations, see
“Table of Emetics.”]

CHAPTER VI.

CHEMICAL AGENTS.

Their mode of action described—Act also vitally—Can change the character of the blood—Morbid changes in that fluid—Subdivision of chemical agents.

THE agents, which we have thus far considered, produce their effect altogether by the impression they make on the vital properties of the tissues. It is on this account, indeed, that the epithet 'vital' has been applied to them. Those which we have to examine, under this division, exert their effects chemically upon the substances with which they come in contact; and, in this manner, may modify the vital properties indirectly. There are some, likewise, that effect chemical changes on parts endowed with vitality, and in this way produce as marked an influence, on the vital manifestations, as many of those agents to which the epithet 'vital' is attached.

I have before observed, that so long as the tissues, which compose the body, are possessed of the vital influence, they resist the changes that would inevitably occur, were this influence withdrawn. The animal body is composed of materials, which are extremely prone to decomposition; but, so long as it is alive, the tendencies to change are controlled by the principle of life, so that putrefaction cannot take place. In like manner, a resistance is presented by it to the influence of chemical agents, unless these agents be in such concentration as to act as powerful irritants, or to disorganize the parts with which they are brought in contact. But this resistance is only within certain limits. We have the most unquestionable evidences, that changes may be effected even in the circulating fluid,—changes

which are palpable to the senses—and we must consequently admit, that if modifications can be produced by chemical influences in a fluid, whence every organ and tissue of the body are formed, a greater or less change may be occasioned in those vessels, whose function it is to form such organs and tissues, and by which the functions of calorification and secretion are accomplished. Of the changes, produced in the blood by chemical agents, we have marked examples in the different tints, occasioned by the inhalation of various gases, as well as in the appearances, which that fluid presents, after certain saline solutions are thrown into the veins. It has been said, indeed, that any one, who believes in such changes, must consent to be ranked amongst the humoral pathologists,—the beings of a bygone period; but this reproach has lost, at the present day, the greater part—if not the whole—of its terrors. Pathologists have discovered, that in flying from humorism to solidism, they have, as in similar cases, wandered from the paths of true observation; and they have exhibited the triumph of judgment and candor over folly and prejudice, by amalgamating the two doctrines, where amalgamation was practicable, and rejecting from each such views as have not borne the test of experience. The present period may be termed eminently eclectic; for, although exclusives occasionally arise amongst us, they are rare, and have—when we take the world at large—but few followers. Many of those, too, who would blush to be esteemed humorists, still believe in ‘critical discharges,’ and ‘efforts of nature,’ although they would, at the same time, spurn the idea, that any substance could get into the blood, without occasioning the most disastrous results. Yet the whole of the phenomena of exanthematous fevers must be, with such individuals, a source of intense difficulty. In any view of the subject, they are sufficiently difficult of explanation; but, in the one we are canvassing, the difficulties are absolutely overwhelming. In the case of small pox inoculation, we insert a minute portion of variolous matter under the cuticle,—bring it in contact, in other words, with the corpus papillare, and with the divided vessels of that body,—and we can predict that, in a proper subject, a fever will break out, in a certain number of days after inoculation, and that after a definite period an eruption will make its appearance, which will go through its regular stages of increment, maturation and declension, leaving the patient, after a time—which, in favorable cases, equally admits of prognostication—perfectly well. It is assuredly not easy to conceive how this extensive secretion of morbid poison can take

place, without presuming, that the action of the capillaries has become modified by the condition of the fluid circulating in them; and that this fluid has had its condition changed by the reception into it of the variolous matter. Still, although we admit this, there is much to be explained,—both as regards the exanthematous fevers, and those, that are unaccompanied by any cutaneous affection.

Of late years, a much greater degree of attention has been paid to morbid conditions of the blood, and to the effects of therapeutical agents upon it; and now, that the horror of the humoral pathology has abated, and indeed almost vanished, fresh investigations will be made into its varying condition in disease, and into the best methods for restoring it to the healthy state.*

In the case, which I have assumed above, the smallpox taint must evidently have been received into the blood, and by the action of this fluid on the capillaries, and on the nerves distributed to them, the exanthematous fever resulted. In other cases, the capillaries and the nerves connected with them, may be first morbidly impressed, and, successively, the condition of the circulating fluid may be modified. Of this we have examples in all the active hyperæmiæ, and in every febrile irritation, which is the consequence of derangement in any portion of the capillary system of vessels. In one or other of these modes, all fevers—miasmatic or common—are probably induced.

The different classes of chemical remedies are not all as important as certain of the divisions of vital agents, which we have considered. Yet some of them are deeply interesting, although generally but little understood by the student, in consequence of their consideration seeming to require a greater amount of chemical knowledge than is actually the case.

When mineral acids or creosote are added to blood out of the body, their action is the reverse of that of alkalies: they coagulate the albumen it contains, and render it solid; and when administered therapeutically, it is probable, that their effects on the blood are similar to those produced out of the body, and that, by increasing the tendency of the blood to coagulate, they are efficient agents in scurvy, and in hemorrhages, especially of the passive kind.

Some chemical agents operate altogether upon the contents of organs, in the same manner as if they were placed in contact

* An interesting 'Report on the chemistry of the blood as illustrative of Pathology,' was lately made by Mr. Egerton A. Jennings, to the 'Provincial Medical and Surgical Association' of England. It is contained in the 3d volume of their 'Transactions.'

with such contents out of the body, and it is, therefore, but necessary to know the chemical character of such contents to adapt the remedy accordingly. This is the case with antacids. Others, again, as antilithics, are of more complex operation, and the same may perhaps be said of disinfectants or antiseptics.

Escharotics,—defined to be ‘agents, which destroy the vitality of the part to which they are applied, and erode or decompose the animal solid,’—are ranked by therapeutists under this division of our subject; but as they are often employed to exert their effects upon distant parts of the organism, in the same manner as epispastics in general, I considered it advisable not to separate the discussion of their operation, as chemical agents, from that of their vital operation. It will, consequently, be unnecessary to recur to them, under this division.

SECTION I.

ANTACIDS.*

Definition of antacids—Great generation of acid in dyspepsia—Acids always in the healthy stomach—Morbid acidity, how induced—Predominance of acidity in children—Antacids only palliatives—Table of antacids.

THESE may be defined—“Agents, that obviate acidity in the stomach or elsewhere, by combining with the acid, and neutralizing it.”

Where acids are present in the stomach, antacids act upon them precisely as they would act out of the body, but, where conditions exist, which are dependent upon the formation of acid elsewhere than in the stomach, or where the acid has to be acted upon through the medium of the circulation—as in the calculous diathesis, of one kind, to be referred to hereafter—the precise *modus operandi* is not so simple. We should hardly be right, perhaps, on this account in deducing, that the sole operation of antacids is of a purely chemical character. Although their immediate action may be such, they may likewise, when taken into the circulation, so modify the organs of nutrition—the capillary exhalants and absorbents—as to produce an alteration even in the tissue of organs; and, along with change of air and other physical and moral influences, be the means of restoration to health, where the gouty or lithic acid diathesis exists.

The generation of an unusual quantity of acid in the stomach is one of the most ordinary symptoms of dyspepsia. It is indicated by acid eructations; violent heartburn; and marked

* From anti, ‘against,’ and acidum, ‘acid.’

effervescence, when a carbonated alkali is taken;—the acid, in the stomach, laying hold of the alkaline base, and the carbonic acid being given off, in such quantity, occasionally, as to sting the nose—much in the same manner as champagne or any brisk fermented liquor.

In a state of health, two acids are always present in the stomach, after food has been received into the organ, or indeed when any substance—not entitled to the name of *aliment*—is present there.* They are the hydrochloric or muriatic, and the acetic;—the quantity of the former being considerable. Now, if these acids accumulate from any cause, they may give rise to all those signs, that indicate the existence of an undue quantity of acid in the organ.

In such a case as this, if we administer an antacid, we can obviously only palliate the symptoms by it, although we may do this successfully for the time. From an early period of life, I have been very subject to this painful affection,—so much so, that I have always carried a carbonated alkali about with me—and although, after errors in regimen, I have occasionally suffered to such an extent as to approach vomiting, in no instance have I failed to allay the uneasy sensation by an adequate quantity of the alkali, and it has not usually been necessary to repeat the dose.

To effectually remove the complaint, we must inquire narrowly into the causes, that may have occasioned the unusual generation of acid, and attack those pathological conditions; for the presence of the acid, in undue quantity, can be regarded as nothing more than a symptom of such condition. Now, we observe cardialgia under two very opposite aspects. In one, the lining membrane of the stomach is inflamed, and we have a true case of chronic gastro-enteritis: in the other, there is sufficient evidence of the different functions being affected asthenically. In the former state, the organs, whose office it is to secrete the gastric fluid, are inordinately excited, and this excitation has to be allayed by the appropriate employment of depletives and revellents: in the latter, we have to remove the atonic condition of the mucous and muscular coats, which gives occasion to the too long detention of the food in the stomach, and to a tardy action of the gastric secretions and functions upon it.

The want of attention to the existence of these two pathological conditions, which give rise to very similar symptoms, and

* ‘Elements of Hygiene,’ p. 221.

require a patient diagnosis, is the cause of much of that empiricism, which prevails in the treatment of dyspepsia. Under any circumstances, it is often extremely difficult of management, but the difficulty is largely augmented by ignorance of those points.

At one time, it was—and still is, by many—conceived, that whenever we meet with a predominance of acidity in the stomach, it is owing to the elements of the food reacting upon each other;—to the food being detained so long in the organ, that its elements enter into new affinities; and, accordingly, that the acid is, in such cases, the direct product of the aliment employed; and, as saccharine substances produce the effect most markedly, the position has been considered to be confirmed. A slight examination of pathological facts will shew the fallacy of this view of the subject. Every dyspeptic, liable to heartburn, must have observed, that when particular articles of diet have been taken, he has felt the uneasiness almost immediately after they have reached the stomach; and when it has been impossible for time to have been afforded for the transition through the vinous and acetous fermentations. This transition is not effected in an instant; yet, almost instantaneously, after a weak saccharine solution has been taken, the dyspeptic feels the cardialgia; and if he has recourse to his carbonated alkali, the presence of an acid in the stomach is unequivocally demonstrated.

The fact of the generation of acid being favored by particular articles of diet rather than by others has been noticed by every dyspeptic, and has been a puzzling circumstance to them as well as to the medical attendant. As acid is equally evinced, whether certain animal substances—as melted or empyreumatic butter, or saccharine substances be taken, it has been an interesting question to determine the precise character of the acid formed;—which, on the idea of its being produced from the reaction of the elements of the food on each other, ought to differ in these different cases. This perplexity is well exhibited in a deeply interesting case of dyspepsia, complicated with other affections, which is given by Dr. Paris. These are the patient's own words—"I find that the perpetual recurrence of my old headaches leaves me nothing for it but to turn them into a subject of amusement. I have been reading some speculations about muriatic acid in the human stomach, and would like very much to know what acid is in mine; and I wish you would put me in the way of testing it, for I can obtain any quantity. If it is a vegetable acid, how does it get into giblet soup, or salt beef, or fresh butter, *cum multis aliis*? If it is an animal acid, I know

of none except the phosphoric, and I have no idea of making a match-box out of my viscera, so I vote at once it is not that: if it is a vegetable acid, how comes it that I may eat a dozen *ripe* peaches, and be none the worse for them? But wo to me if I eat a buttered muffin; *ergo*, I infer that it is not wholly the acetic acid; and if not, what else can make *sweet* tea, or any thing like ale, beer, or porter, perfect poison to me? As for an animal acid, there is no poison for me like strong broth, or soup; *ergo*, there must be some villainy in that. I was told, the other day, that baked meat would disagree with me, and I find this to be the case. Now, for the muriatic acid, which I strongly suspect to be the one under which I suffer, for the action on my teeth, when I am sick, is too sharp for any thing less pungent; I find that if I eat salt meat, an acid is immediately formed in my stomach, and yet I can take any quantity of salt with my meat, without being the worse for it: how can this happen?"*

The true explanation of these pathological phenomena is this. There are certain articles of diet, which—when they come in contact with the lining membrane of the stomach of a dyspeptic—excite the organs, whose office it is to secrete the gastric acids, so that a larger amount of these acids is formed, and in this way acidity is produced,—not from the reaction of the elements of the food on each other. Under this view of the subject, the acids, met with in the stomach, ought to be the same, whatever may be the character of the food, and this is probably the case;—the hydrochloric acid always, perhaps, predominating, as it does in health, and giving rise to the strongly acid effect occasionally produced on the teeth by the eructations, and which every dyspeptic must have experienced.

This, I say, is generally—if not universally the case—in dyspepsia, but there are articles of diet, which, under particular circumstances, become so suddenly acid, that acidity may be induced by them, without the supposition of undue secretion of the proper gastric acids. Milk is one of these. This fluid, it is well known, becomes acid almost instantaneously, when the air is highly charged with electricity, and there is reason to believe, that something similar may occur in the stomach, particularly in children. The predominance of acidity is so great in them, that, as I have elsewhere remarked, most of the diseases of childhood have been ascribed to it: such predominance may be partly owing, in them, to the cause just assigned, and partly

* 'Treatise on Diet,' Amer. edit. p. 202.

to augmented secretion of those acids, which, as we have seen, always exist in the stomach, in the state of health. In children the presence of unusual acid is easily detected:—the smell of the breath; the odour and taste of the regurgitations; the smell of the alvine evacuations, and their green colour, sufficiently indicate it. This greenness is owing to an admixture of acid with healthy bile, although it has been invoked to demonstrate the existence of disorder in the biliary system. If we take healthy bile and add muriatic acid to it out of the body, we find a green colour produced by the union. It is obvious, then, that, in this case, we should be egregiously in error, were we to give remedies which are conceived to modify the condition of the biliary organs, and that all our endeavours should be confined to the removal of the condition of the gastric apparatus, which gives occasion to the acid predominance.

In adults, a certain degree of acidity is perhaps present, when not indicated by the ordinary symptom,—heartburn. It may be the cause of that irritability of the stomach—characterized by vomiting, whenever food is received into the organ—as well as of the headache, and sleeplessness, which we find to be relieved by full doses of the carbonated alkalies. In those cases of gastric irritability, and in the sleeplessness in question—which consists of watching without any apparent bodily indisposition—half a drachm or two scruples of the carbonate of soda will, at times, act with surprising efficacy; the vomiting will cease in the one case; sleep will follow in the other; and all the uneasy feelings, in both will cases, will speedily vanish.

From what has been said, it will be manifest, that antacids can be regarded merely as palliatives. When administered to neutralize acid in the stomach, they can act only on that, which is in the organ. They cannot prevent the formation of more. To cure the cardialgia radically, the pathological condition, which gives occasion to the undue secretion of the acids, must be obviated. This, we have seen, is sometimes inflammatory; but, in by far the majority of cases perhaps, the excited condition of the organs, by which the gastric juice or gastric acids, are secreted, is accompanied by a state of asthenia of other parts of the stomach. The muscular coat has its energy impaired; and, by restoring the balance, by the appropriate administration of tonics and gentle excitants—singly or combined—accompanied by the adoption of an appropriate regimen, we find the symptoms relieved, and, if the plan be properly persisted in, often

entirely removed; but no plan of treatment, which does not combine an attention to diet and regimen, can prove effectual.

As the pathological cause of cardialgia is commonly asthenic, it can be understood, why the union of antacids with tonics—as of magnesia or bicarbonate of soda with charcoal, or bitters—is so generally useful in that affection.

Amongst the different alkalies and alkaline earths, the therapeutist has ample choice to adapt his remedies to the various complications that may arise. If he desires a simple antacid, to be administered singly, or along with some vegetable bitter, he chooses the liquor potassæ; the liquor calcis; or the carbonates of potassa or soda: but if he wishes, at the same time, to produce some degree of excitation in the mucous coat of the stomach, and through it, on the muscular coat, he selects the aminonia, or its carbonate. The carbonates are the milder preparations; but, occasionally, uneasiness is felt from the extrication of the carbonic acid gas, which is given off as soon as the alkali meets with the gastric acids; the gas, at times, instead of passing off through the upper orifice of the stomach, proceeding into the small intestines, and giving rise to colic, and to much intestinal disturbance. No such effect can be produced by the exhibition of the pure alkalies, which may be given in a state of proper dilution. The same thing, of course, applies to the alkaline earths, and for this reason, the pure magnesia, or that from which the carbonic acid has been driven off by heat; and lime water, which, when pure, contains no carbonic acid, are, in those cases, to be preferred. As regards these earths, too, the practitioner has a ground of preference, which cannot be lost sight of. The salts formed by the union of the gastric acids with magnesia, are possessed of laxative properties; whilst those, formed by the union of lime with the same acids, are of a contrary character. If, therefore, the predominance of acidity be accompanied with constipation, or appears to demand the use of laxatives, the former earth is selected;—whilst the latter may be indicated, under opposite circumstances.

With respect to the diet and regimen, which may be advisable in these cases, much will depend on the individual—as regards the diet especially. Substances, which are easily managed by the digestive powers, and which individual experience has *shewn* not to be ‘dyspeptic,’ must be taken; and as for other articles, that may have not been made the subject of experiment, I must refer to another work,* for details regarding their comparative digesti-

* ‘Elements of Hygiène,’ p. 205 to 377: and p. 505.

bility. Of the proper regimen I have spoken, partly in that work, and partly under the head of 'Revellents,' in the present volume. Nothing is so markedly salutary, in these cases, as a thorough change of all the physical and moral circumstances surrounding the individual, and every dyspeptic must have noticed the freedom from his usual ailments, which he has experienced during the exercise of body and mind, which travelling affords. It is the opinion of Dr. James Johnson, that the most inveterate dyspepsia, where no organic disease is present, might be cured by a journey of two or three thousand miles over such a country as Switzerland.*—Of course, the more varied the scenery and the atmospheric conditions the greater is the revulsion produced by travelling; but in countries not possessed of all those advantages, mere travelling exercise, with due attention to diet, is perhaps the most beneficial agency, that can be invoked by the dyspeptic.

Independently of the presence of acidity in the stomach, we find, that a condition of the system may exist, which may require the use of antacids; but, on this matter, I shall have to treat more especially, under the head of 'Antilithics.'

* 'Change of Air.' Amer. edit., p. 30.

TABLE

OF ANTACIDS, AND THEIR OFFICIAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Ammonia. Ammonia. Volatile Alkali.		Aqua Ammonia. Liquor Ammonia. Water of Ammonia. (See Table of Excitants.)	} m 5 to 20;— largely diluted.
		Ammonia Carbonas. (See Table of Excitants.)	} gr. 5 to 10.
		Liquor Ammonia Subcarbonatis. (Ammon. subcarb. oz. 4; aq. distil- lat. O i.—Dissolve and filter.)	} f. dr. $\frac{1}{2}$ to f. dr. 1.
Calcis Carbonas. Creta. Carbonate of Lime. Chalk,	} From England. Not found in the United States.	Calcis Carbonas præparatus. Creta præparata. Prepared Chalk. (Levigated.)	} gr. 10 to 50.
		Trochisci Calcis Carbonatis. (Calcis carbon. præpar. oz. 4; g. acaciæ oz. 1; nucis myristic. dr. 1; sacch. oz. 6. Make into troches with water.)	
Calx. } Lime. }	} By burning carbon- ate of lime, so as to drive off the carbon- ic acid.	Liquor Calcis. Aqua Calcis. Lime Water. (Calcis oz. 4; aq. distillat. cong.)	} f. oz. 2 to f. oz. 4.
Magnesia. Magnesia. Calcined Magnesia. (See Table of Cathar- tics.)	}	Trochisci Magnesiae. (Magnes. oz. 4; gum acac. oz. 1; nu- cis myrist. dr. 1; sacch. oz. 6. Make into troches with water.)	} gr. 10 to 30.
Magnesia Carbonas. Carbonate of Magne- sia. Subcarbonate of Mag- nesia. (See Table of Cathar- tics.)	}		} gr. 10 to dr. 1.
		Trochisci Carbonatis Magnesiae. (Magnes. carb. oz. 6; sacch. purif. oz. 3; nucis myrist. scr. 1. Make into troches with mucilage of tra- gacanth.)	
Potassa. Potassa fusa. Caustic Potassa. (Oxide of Potassium.) (See Table of Escha- rotics.)	} By evaporating a solution of potassa, and running it into moulds.	Liquor Potassæ. (Potass. carbon. lb. 1; calcis recent. ust. lb. $\frac{1}{2}$; aq. distil. bullient. cong. Strain.)	} m 10 to 30.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Potassæ Bicarbonas. Potassæ Carbonas. <i>Bicarbonate of Potassa.</i>	By passing carbonic acid into a solution of carbonate of potassa, and crystallizing.	.....	gr. 10 to 60.
Potassæ Carbonas. Potassæ Subcarbonas. <i>Carbonate of Potassa.</i> <i>Salt of Tartar.</i>	By dissolving the impure carbonate of potassa (pearl ashes) in water; filtering, evaporating, and crystallizing. Also, by burning together a mixture of supertartrate of potassa and nitrate of potassa.	.....	m 10 to 40.
		Liqnor Potassæ Carbonatis. (Potass. carbon. lb. 1; aq. distillat. f. oz. 12; dissolve and filter.)	} m 10 to f. dr. 1.
Sodæ Bicarbonas. Sodæ Carbonas. <i>Bicarbonate of Soda</i>	By passing carbonic acid through a solution of the carbonate of soda, and crystallizing.	.....	gr. 10 to 60.
Sodæ Carbonas. Sodæ Subcarbonas. <i>Carbonate of Soda.</i>	By purifying the impure carbonate of commerce (Barilla.)	.....	gr. 10 to dr. $\frac{1}{4}$.
		Sodæ Carbonas exsiccatus. (The carbonate of soda exposed to heat, so as to drive off its water of crystallization.)	} gr. 5 to 15.
		Aqua Sodæ Carbonatis. <i>Solution of Carbonate of Soda.</i> (Sodæ carb. oz. 1; aq. distillat. O j.) —Each f. oz. contains $\frac{1}{4}$ dr. of the carbonate.	} f. oz. $\frac{1}{4}$ to f. oz. 2.

SECTION II.

ANTALKALIES.

Definition of Antalkalies—Cannot often be needed—Alkaline state of the habit—Mode of improving defective nutrition—Table of Antalkalies.

THIS class of medicines cannot detain us, inasmuch as circumstances but rarely arise, which can be conceived to indicate their use. “Free alkalies, it has been asserted, are rarely present in the stomach.”* I should be disposed to aver, that they are never met with in that organ. It is not, indeed, easy to conceive their presence there, unless we consider, that the gastric solvent varies materially in character, so that at one time it shall be the very antithesis to what it is at another. In the case of fistulous opening into the stomach, to which I have more than once referred,† opportunity was afforded for examining the gastric secretions under various circumstances of sickness and of health. In every case, the acid character was marked. The hydrochloric and acetic acids were always contained in it in considerable quantity.

The idea, that free alkalies may exist in the stomach, doubtless rests on the affirmations of Dumas and others, who have asserted, that the ‘gastric juice’ was acid or alkaline, according as the dog—the animal experimented on—was fed on animal or vegetable diet. But these experiments were made on dogs; and on the mixed secretions from the lining membrane of the supra-diaphragmatic portion of the alimentary tube, from the

* Thomson, *op. citat.* ii. 594.

† For details of this case, see ‘*Elements of Hygiène*,’ p. 216; and ‘*Human Physiology*,’ Second Edit. i. 514.

salivary glands, and the stomach itself; and, besides, they do not seem to have been performed with care or accuracy, as the best testimony—certainly in the case of man—is in favor of the gastric secretions being always acid. Such being the fact, the existence of free alkalies in the stomach seems impossible. They could not fail to be immediately neutralized.

It has been long maintained, that an alkaline state of the whole habit may exist, and it is considered to be indicated by “the chemical quality of the urine, accompanied with paleness of the countenance, lassitude, irregular bowels,—sometimes costive, sometimes too relaxed,—and a tendency to hysteria in females.” Mental as well as corporeal causes, diseases affecting the spinal cord, whether in the loins, back, or neck, or whether paralysis be present or not, it is said, produce an alkaline state of habit, which is displayed in the urine.* But the inferences, deducible from the condition of the urine, are not as clear as they might appear to be. Its character varies from numerous causes; and, even in health, we notice the greatest difference in its character. At times, it may be acid—at others, alkaline. Except as regards its colour, transparency, and depositions we cannot say much; and, indeed, great obscurity rests on the causes of these qualities. On this account it is, that uroscopy is not as much attended to, at the present day, as it was formerly. The condition of the urine varies materially according to the varying condition of the functions of nutrition, and, as we shall see in the next section, a state of the system may exist, which might, perhaps, be esteemed of an alkaline character, and which is capable of being best rectified by the administration of acids.

Professor Chaussier, of Paris, in a letter to M. Broussais, has affirmed, that, in all states of disease or of prolonged irritation, the secretions become alkaline. He observes; “From a great number of researches and experiments, which I formerly made, it has appeared to me: *First*. That in general, in a state of health, all the soft parts and the greater proportion of the fluids of the animal body are more or less acid, or, if it be preferred, have a tendency to redden test papers: *Secondly*. That others appear to be neither acid nor alkaline: *Thirdly* and finally: that some (as the semen) are alkaline. But, in a state of disease or prolonged irritation, all contract an alkaline quality, which renders them capable of changing the test papers to a

* Thomson op. citat. p. 394.

green colour; thus, the perspiratory humor, which in a state of health is always acid, sometimes assumes an alkaline character. The urine which in a state of health, immediately reddens litmus paper, becomes evidently alkaline, if the kidneys or bladder are in a state of irritation or inflammation: in some cases it even contracts a strong ammoniacal odor, which is perceptible at some distance. It is the same with all the excretions, which are augmented by any grade of irritation. Thus, in some cases of coryza, the humor, which flows from the nostrils, is so acrid as to occasion the swelling of the upper lip, which is generally regarded as a sign of a scrofulous constitution. It is the same as regards the excretions from the bronchiæ or lungs, which always, when the irritation or the disease becomes violent, assume an alkaline characters, and give a green color to test papers. The humor, which flows from ulcerated cancer or other analogous affections, is also more or less alkaline: it has even appeared to me that in a healthy subject, having a suppurating wound, the pus of which is laudable, that this pus will not, or at least will only feebly, redden test papers, but if the suppurating surface be wiped several times, or if it be irritated in any other way, it soon furnishes a clear serosity, which then changes the papers to a green color.”*

It was from views, similar to those of Chaussier, that many of the older pathologists considered those cases of inveterate cachexia, which exhibit, so strongly, a firmly implanted vice, in the nutritive functions of every part of the frame, to be evidences of a predominant alcalescency, that could only be removed by the administration of acids. These views have almost passed away, but we ought not to lose sight of the pathological fact, that such a vice of the nutritive function may be accompanied with an alkaline condition of the urine, in the same manner as one form of the calculous diathesis—also dependent upon faulty nutrition—is indicated by the deposits of the phosphates from the urine. It is, however, to the removal of the derangement of the function of nutrition, that our attention—as pathologists and therapeutists—has to be directed. In cases such as these, I have produced a thorough revolution in the system of nutrition by allowing the patient a certain quantity of sugar daily—formed into a syrup, and given to the adult in such quantity, that three or four ounces of the sugar shall be taken daily. Under this diet, or medicine,—for it is better, in order to infuse

* Broussais' 'Pathology.' Hays's and Griffith's translation, p. 343.

confidence, to give it as medicine, and to medicate it by the addition of a little rose water,—the patient has rapidly gained weight, and the system of nutrition has been so changed, that the cachexia, induced by poor living, and residence in confined, unhealthy situations, as well as that which characterizes atrophy, without any manifest local cause, has been removed; a complete renovation has taken place; inveterate cutaneous diseases have disappeared, and old ulcers have filled up and cicatrized. The sugar, in these cases, appears to act both as a ‘substantive’ and ‘adjective’ aliment;—that is, it furnishes a richer and more abundant chyle, and it puts the digestive organs in a condition to derive a larger quantity of nutriment from the food than they would otherwise do;—thus acting, also, as a condiment. It is, I conceive, in consequence of this additional richness of the circulating fluid, as well as of its modified condition in other respects, that the capillaries, into which it passes, are excited to fresh activity, so that the nutrition of the previously emaciated frame is surprisingly augmented. That sugar is capable of modifying considerably the condition of the circulating fluid is sufficiently exhibited by the observation, first made, perhaps, by Professor Hegewisch, of Keil, that a solution of sugar produces the same alteration in the colour of black blood as the saline solutions. It changes it to a bright arterial hue.

It is,—I am inclined to think,—owing mainly to the presence of sugar, that some of the alterative syrups—the compound syrup of sarsaparilla, for example—exert their beneficial agency; and an intelligent patient,—from the influence exerted on his own body by such preparations,—informed me recently, that he had arrived at the same conclusion. The remedy is simple—so simple that it may be difficult to induce the practitioner to place much confidence in it; but if he will reflect on the indications he wishes to fulfil, and on the effect which the sugar is capable of exerting, he will not, I think, hesitate, and I feel confident, that the result will gratify, and, in many instances, astonish him.

[*Table of the chief Antalkalies and their Official Preparations :*
The different Acids—mineral and vegetable.]

SECTION III.

ANTILITHICS.*

Definition of antilithics, and of lithontrypics—Calculous diathesis—Lithic and phosphatic diatheses—Different varieties of calculus—Therapeutical application of antilithics to those varieties—Lithontrypics—Table of antilithics.

PERHAPS the most interesting class, among the chemical agents, is the one, which we have now to consider. It comprises—agents, that counteract the tendency to the formation of calculous concretions in the urinary organs. Under the same head may be investigated the operation of lithontrypics,† or of agents, which are capable of dissolving calculous concretions; but as our means for this purpose are extremely limited, and rarely available or successful, I shall direct my attention mainly to the class of antilithics.

I have said that this is, perhaps, the most interesting of the classes or subdivisions of chemical agents. I might, indeed—with propriety, perhaps—have extended the remark to therapeutical agents in general; for what disorder is there, that excites more mental uneasiness and apprehension than any form of calculous deposition. The pain attendant upon the presence of stone in the bladder; the inutility of remedial agents, when once it has formed, excepting so far as concerns the prevention of its augmentation; and the serious operation demanded for its removal,—are all sufficient grounds for the anxiety, which is felt by every one, when he has reason to believe, that he is laboring under a calculous diathesis.

That such a diathesis may be present we have the most un-

* From *αντι*, 'against,' and *λιθος*, 'a stone.'

† Lithontrypics; lithonthrictics,—from *λιθος*, 'a stone,' and *θρυπτω*, 'I break.'

questionable evidence, and when it exists to a marked extent, the greatest difficulty occurs in removing the tendency to deposition. Often, it appears to be owing to an organization derived from progenitors; when—like every other hereditary tendency—it is almost irremediable, although due attention to diet and regimen may do much.

That this diathesis is connected with a morbid condition of the secerning function of the kidney is clear. We find the organ forming that which it ought not, and the urine depositing that which it ought not; but this vice of secretion is as clearly connected with a morbid condition in other organs; indeed, the whole system of nutrition is often implicated; the gastric functions are imperfectly performed; the nutrition of the body is impaired, and in the phosphatic diathesis, especially, when largely developed—every symptom is present, which is considered to indicate ‘cachexia.’

The ordinary urinary calculi arise from the deposition of substances contained in that fluid in a state of health, but rendered insoluble, owing to various circumstances to be considered hereafter; but some calculi—as the oxalates—do not exist in the urine, in health, and must, consequently, be formed, by chemico-vital influence, in the kidney. It becomes, however, an interesting topic of inquiry—whether the mischief is, in these cases, seated altogether in the kidney, or whether it may not be, in part, owing to the blood being modified, in consequence of general faulty nutrition, so that it contains matters, which do not exist in it in the healthy state. In reply to this, it has been urged, that such matters ought to be detected by the chemical analyst: but this objection is invalid, for the reasons I have elsewhere stated;—namely,—that it is by no means easy to detect even an inorganic substance,—of whose presence we are certain—when it becomes mixed with compounds of organization. It may be so masked by the latter, that its presence cannot be indicated by the ordinary—or, indeed, by any—reagents. On the other hand, we have strong reason for presuming, that the disease is not altogether seated in the kidney, when we reflect on the great similarity, that exists between the calculous and the gouty diathesis. It is a common remark, founded on just observation, that of the children of gouty parents, some may be liable to gout, and others to calculus,—the males, who are exposed to indulgence in the ordinary exciting causes, being more liable to the former disease;—the females to the latter. Both diseases are accompanied by more or less gastric and intestinal derange-

ment, and by modified nutrition in general; and another striking point of similarity in the presence of the lithate of soda in the concretions, which are met with in the joints of those, who have suffered from repeated arthritic attacks. Now, the lithic or uric acid was, at one time, supposed to exist in the urine only, and, as we shall find, it is the constituent of one form of urinary calculi; yet, in these gouty cases, we have it separated from the blood, by other organs than the kidneys, and we are, consequently, compelled to infer, that, in calculous cases, the disease may not merely consist in faulty secretion by the kidney; but that the blood may contain elements, which can be combined in other secreting organs; and clearly are so, in the case of the gouty concretions, to which I have alluded.

In the treatment of calculous cases, therefore, it becomes a matter of moment, that our attention should not be directed solely to the condition of the kidneys; but that it should be extended to the state of the whole system; and experience exhibits the correctness of this doctrine.

The two chief calculous diatheses are—the ‘lithic’ or ‘uric,’ and the ‘phosphatic.’ The former of these is attended by a state of the urine, which reddens litmus paper; by yellow, red, or lateritious, or pink depositions of the lithate of ammonia; or by the appearance of ‘red gravel,’ which consists of crystals of lithic acid.

In the phosphatic diathesis, the urine is pale; at times alkaline on the use of reagents; and there is a deposition of ‘white gravel,’ or crystals of phosphate of magnesia and ammonia; or the white sediment contains the mixed phosphates of magnesia, ammonia, and lime.

At times, these two diatheses are not commingled, or rather do not alternate in the same individual, but there is usually a great disposition for the lithic to change into the phosphatic. The urine becomes pale, under slight causes of general, or gastric disorder; mixed lithic and phosphatic deposits occur, or an iridescent pellicle of triple phosphate forms upon its surface.* At length, the urine becomes alkaline, and the white gravel is deposited. The phosphatic diathesis is now confirmed.

These are the chief diatheses, but others may be enumerated. For example, the crystals of the triple phosphate are apt to be changed for a pulverulent deposite of that phosphate, mixed with the phosphate of lime. This mixture constitutes the ‘fusible

* Marshall Hall's ‘Principles of Diagnosis,’ 2d Amer. edit. p. 357.

calculus,' and into this all the other forms of calculous diathesis have a tendency to pass. Again, a diathesis exists, in which the 'mulberry calculus' or that which consists of oxalate of lime may be formed.

For therapeutical purposes, the different varieties of calculus may be thus enumerated:—

1. The lithic or uric acid ; or the yellow, pink, red, &c.
2. The phosphatic, or the white.
3. The mixed phosphates of magnesia and ammonia, and of lime,—or the fusible.
4. The oxalate of lime,—or the mulberry.
5. The alternating.

From different data, examined by Dr. Prout, it appears, that the lithic acid predominates in more than one-third of the whole number of urinary calculi ; and, very generally, lithic acid forms the nucleus even of other varieties of calculi. It would seem, consequently, that the deposition of lithic acid is a primary step in the formation of urinary calculi, and that the phosphatic and oxalatic formations are the result of a gradual transition from the lithic acid to the phosphatic or oxalatic diathesis. In the progress of this transition, the lithic acid deposition is, in the first instance, changed into one of the lithate of ammonia, with a loss of the tinge derived from the coloring matters of the urine. After some time, this last gives place to a sediment, which is chiefly composed of carbonate and phosphate of lime ; and this is ultimately succeeded by a deposition of the phosphates of lime and magnesia, in combination with ammonia. From all his inquiries on the interesting subject of urinary depositions, Dr. Prout conceives himself warranted in deducing the general *law*, " that in urinary calculi, a decided deposition of the mixed phosphates is never followed by other depositions."

Any unusual formation of acid in the stomach, or elsewhere, may be the cause, why the lithic acid is deposited from the urine. If we add acid to healthy urine, the lithic acid is thrown down in small reddish crystals. The lithate of ammonia, which exists in the urine, is decomposed ; the acid, which we add, lays hold of the base, and the lithic acid is deposited : We can thus understand, that a deposition of lithic acid crystals may be an evidence of dyspepsia. But, in this last affection, as well as in other states of the system, there may be an undue formation of the lithic acid or of the lithate of ammonia,—as in those labor-

ing under the lithic acid diathesis,—and calculus or gravel may occur from this cause.

The remedies belonging to the class of Antilithics, after what has been said, will be sufficiently apparent. Whenever, from the appearances presented by the urinary deposits, and by the concomitant symptoms of lithiasis, it is manifest, that the lithic acid or the lithates are separated from the urine, in undue quantity, remedies of the alkaline class should be employed to neutralize any predominant acid, whilst tonic and revulsive means are employed for improving the general health. Dr. Prout has shewn, that when the lithic acid diathesis exists, and the urine is constantly acid, high colored, and concentrated, repeated doses of alkalis will not only render the urine alkaline, but keep it so as long as they are employed. With these views, we administer the liquor potassæ, or the carbonates of potassa and soda, and direct the employment of some bitter principle, with a thorough change of all the physical and moral circumstances surrounding the individual,—if this be practicable. Change of air, of society, and scenery must, indeed, be regarded as amongst the most important agents, not only in the lithic acid—but in every kind of calculous—diathesis. The importance, too, of keeping up a free cutaneous exhalation is obvious. The perspiration is acid, and if this acid be not exhaled, its retention in the system may give rise to that acid predominance of which I have spoken. It is on these grounds, that Dr. Wilson Philip affirms, “that dyspepsia tends to increase the deposition of lithic acid, and to lessen that of the phosphates, both by producing acidity of the primæ viæ, and by rendering the skin inactive;” and—“that indolence has the same tendency, both by inducing dyspepsia, and by lessening the activity of the skin, in proportion as it impairs the vigor of the constitution.”*

Dr. Thomson asserts, that the lithic acid, in a healthy condition of the habit, is freely thrown off by the cutaneous exhalants,† but I apprehend he has not sufficient ground for the assertion; nor is it necessary to suppose the exhaled acid to be the lithic—to account for the increased deposition of the lithic acid from the urine, in the cases we have been considering. Any

* ‘Medical Transactions of the College of Physicians of London,’ vol. vi. art. 9.

† Op. citat. i. 600.

acid predominance may, as we have seen, induce the same effect.

The causes, that give rise to the deposition of the phosphates, are of a different character from those that occasion the lithic deposits. In one respect, indeed, they are antitheses to each other. The phosphates in healthy urine are considered, by Berzelius to be held in solution by free phosphoric and lactic acids; and, if any thing interferes with the presence of these acids in due quantity, the phosphates are deposited. Prout offers another explanation, which is more simple and intelligible. The phosphates, he says, exist in the urine as supersalts, and in this state are soluble; but, if any thing neutralizes the redundant acid, so as to reduce the supersalt to a neutral salt, it is then deposited—the neutral phosphates being insoluble. If a few drops of ammonia be added to healthy urine, the phosphates are deposited, and the cause of this deposition is differently explained by Berzelius and by Prout, according to their peculiar views;—the former considering, that the ammonia neutralizes the free phosphoric and lactic acids; and the latter, that the excess of phosphoric acid is neutralized, and the superphosphate, being thus reduced to the state of a neutral phosphate, a deposition ensues.

The general symptoms, which accompany the deposition of the phosphates, are often very distressing: both the *physique* and the *moral* are greatly implicated. Derangement of the digestive organs is a universal concomitant, succeeded by every symptom of impaired nutrition. In some cases, in which the bladder has lost a portion of its muscular power—as in disease of the prostate; in affections of the spine, and in the aged, the urine is so long retained in the bladder as to undergo, it is affirmed, a partial decomposition; ammonia is generated, and a deposition of the ammoniaco-magnesian phosphates takes place.

As far as regards the use of chemical remedies, the selection for the phosphatic diathesis is obvious. That, which would be proper for the lithic acid, would be obviously most injurious in this; accordingly, alkaline remedies have to be avoided, whilst acids—especially mineral acids—can be administered with great advantage. They may not only pass into the blood, and act chemically on that fluid, but invigorate the digestive apparatus and prevent fresh deposition.

In cases of the alternating calculi, the treatment has necessarily to be varied, according to the character of the deposition,—acid or alkaline remedies being given according as the deposits are at the time phosphatic or lithic acid; but in the depositions

of oxalate of lime, nothing but general management can be invoked with any great prospect of benefit. There is no chemical antilithic available in these cases. All we can do in this, as well as in the other forms of the calculus diathesis—when inveterate—is to inculcate the necessity of a thorough change of all the physical and moral influences surrounding the individual, so as to break in upon the morbid catenation as effectively as possible. With this view, we recommend travelling air and exercise, with all their revulsive accompaniments; a well regulated diet, and regimen;* attention to the condition of the bowels, and every thing that can induce tone in the economy generally. By thus modifying the whole system of nutrition, the calculous diathesis may occasionally be got rid of, and no farther signs of lithiasis may occur, even when the individual has been previously strongly disposed to, and even laboring under, calculous depositions.

From what has been said, we can fully understand the agency of tonics and astringents, when employed as antilithics. But it has been imagined, that certain bitters, which combine an astringent principle, are peculiarly adapted for such cases; this principle being presumed to enter the circulation, and to act more particularly on the kidneys. At one time, indeed, it was believed—I need hardly say most erroneously—that such vegetables possessed chemical or solvent properties. Of these tonics—presumed to operate especially as antilithics—the leaves of the *diosma crenata* or *buchu*; the root of the *pareira brava*, and the leaves of the *uva ursi* have been mainly recommended; but I am not prepared to corroborate the once prevalent, but now generally exploded, idea, that they produce other results besides those of acting as astringent tonics on the stomach, and of improving the gastric functions.

Thus far of antilithics.—I have not much to add on ‘lithon-thryptics,’ or solvents of calculi. Little or no reliance ought, of course, to be placed upon any substance, administered with this view by the mouth. What effect, for example, could ten drops of the liquor potassæ, taken three or four times a day, have upon any calculus,—in the state of dilution in which the remedy must necessarily arrive at the kidneys: for, to act as a solvent, the alkali would have to enter the circulatory current in the stomach,

* In the case of an intelligent medical gentleman, from the interior of this state (Maryland,) who consulted me some time ago, the phosphatic depositions, which were copious, were invariably corrected by the free use of saccharine aliment.

and proceed with it to those organs. Solvents might, however, be brought into immediate contact with vesical calculi by injection; and, in this way, alkalies and acids, properly diluted, have been employed. Experiment seems to have shewn, that the bladder cannot bear the presence of an alkaline solution, sufficiently strong to dissolve a lithic acid calculus, but it would appear, from the experiments of Sir Benjamin Brodie,—that loose concretions of the phosphates and of carbonate of lime may be acted upon by a weak solution of nitric acid, and thus be gradually removed from the bladder. The strength of the solution, employed by Sir Benjamin, was two minims and a half of the acid to a fluid ounce of distilled water. The injection was sent through a cannula of pure gold. It occasioned no pain; yet the patients experienced relief from all their symptoms; the quantity of adhesive mucus from the lining membrane of the bladder was diminished; and the constant desire to empty the bladder much abated. By testing the fluid, that had been used, with a concentrated solution of ammonia, the phosphates were abundantly precipitated,—proving that the calculi in the bladder had been acted upon.

It has likewise been proposed by Messrs. Prévost and Dumas, to employ galvanism for the decomposition of calculi in the bladder, by passing the wires, connected with the poles of a galvanic apparatus, into that organ—but the proposition has received little attention. It is probable, indeed, that any decomposing power, which could be introduced within the bladder in this way, would be liable to act upon the organ itself, and, consequently, not be devoid of danger. Cystitis is an affection to be apprehended from all such agents.

The most important lithonthryptics belong to the domain of surgery, and do not, therefore, fall under consideration in this work. It seems clear, from the experience of practitioners on both sides of the Atlantic, that there are cases of urinary calculi, which admit of being broken down in the bladder, by the introduction of contunding instruments into that organ, without the bladder necessarily suffering; and the operation of lithotrity, or lithothrpsy, or lithotresis must be included amongst those improvements, for which the philanthropist has to thank the genius and daring of the modern surgeon.

TABLE
OF THE CHIEF ANTILITHICS, AND THEIR OFFICINAL PREPARATIONS.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Acida. <i>Acids.</i> (The different Acids —mineral and vegetable.)			
Alkalia. (See Table of Antacids.)			
Revellents,—especially change of air, &c. (See Table of general Revellents.)			
Tonics. (See Table of Tonics, & especially, [?] <i>Diosma crenata</i> .) <i>Buchu leaves.</i> (See Table of Diuretics.) And <i>Uva Ursi.</i> <i>Uva Ursi.</i> (The leaves of the <i>Arbutus Uva Ursi</i>)— astringent and tonic.			
			scr. 1 to 3.
		Decoctum Uvæ Ursi. Fol. uvæ ursi oz. 1; aq. f. oz. 20.— Boil to a pint and strain.	f. oz. 1 to f. oz. 2.

SECTION IV.

DISINFECTANTS.*

Definition of disinfectants—Antiseptics—Modus operandi of disinfectants—Bad effects of odorous fumigations—Of heat, and of the mineral acid vapours and the chlorides, as disinfectants—Use of antiseptics—Table of disinfectants.

THE term ‘disinfectants’ has been restricted by Dr. Thomson to those agents, that are capable of neutralizing morbid effluvia; but as he has used it synonymously with antiseptics, the definition is manifestly not sufficiently comprehensive. I shall, therefore, in addition to the agents described, enter somewhat into the consideration of substances, which may be esteemed ‘antiseptics’—or capable of removing any incipient or fully formed septic condition of the living body, or of any part of it.

To inquire fully into the subject of disinfection, it might be advisable to consider every form of atmospheric vitiation, whether it consisted in the presence of some known noxious gas; of those terrestrial emanations, which are known to give rise to intermittent fever; or of those effluvia, which appear to proceed from one labouring under a disease presumed to be communicable, and are capable of producing the same disease in one exposed to their influence. I have, however, in another work,† entered pretty fully into the history of physical agents that influence human health, and I shall, consequently, confine myself chiefly, in this place, to some observations on the mode of disinfecting or purifying any confined space from morbid miasmata—terrestrial or animal.

It is manifest, that every such disinfecting agent must be capable of chemically combining with the morbid effluvia, and

* Antiseptics, *Medicamenta antipestifera*: from ‘dis,’ (privative or negative) and infect.’

† ‘Elements of Hygiène,’ p. 35.

thus of depriving them of their morbid properties. In no other way can we conceive that disinfectants act. Although we are entirely unaware of the precise character of the *tertium quid*—if it may be so called—which emanates from a body labouring under a contagious disease, and produces a like disease in another body exposed to it, we have the best possible evidence, that such an emanation or miasm is given off; and if this—in the condition in which it is exhaled—comes in contact with a fit recipient, disease will almost certainly result. The emanation must, therefore, have its very nature destroyed, and the product of the decomposition be altogether harmless.

I shall not enter here into the discussion as to what diseases are unquestionably contagious. Much that is erroneous has doubtless been written and conceived on the subject. It is sufficient for us to know, that a locality is considered, from any cause, to require disinfection, and to inquire into the means for accomplishing this object.

There are but few agents which can be employed, with well founded expectations of success, as disinfectants. Many that are used are positively injurious, exerting no destructive effect on the noxious emanations, whilst they interfere with the purity of the air, and thus favour their pestiferous agency. Of these, burnt sugar may be regarded as one. It is often employed with the view of concealing other odors; but it can obviously do so merely by its own odor overpowering that of other substances, whilst the amount of adventitious matter, in the air of the apartment, is augmented, where proper ventilation is not adopted; and, where it is, the ventilation is more effective, when these presumed disinfectants are not employed. Even where the true disinfectants are used, it is highly necessary, that the air of the sick chamber should be changed by the adoption of a thorough system of ventilation. Every such agent adds a material to the air of the apartment, that ought not to be present, and is consequently so far deteriorating; whilst many of them are so penetrating as to induce much irritation of the air passages, and, under certain circumstances, their employment might obviously be followed with marked disadvantage. They might disinfect the air, yet occasion morbid mischief from their own irritating qualities. Fortunately we have become acquainted with the properties of several substances, whose disinfecting agency is marked, whilst they are devoid of the inconveniences to which I have alluded.

What I have said, regarding the effect of burnt sugar, applies equally to many other substances, that were, and still are, much

used as disinfectants,—such as burnt vinegar, benzoin, camphor, and different aromatic substances. They are not more efficacious than the burnt sugar, and they are equally liable to the disadvantages attendant upon its employment. Heat has long been esteemed a powerful disinfectant, but its reputation has chiefly reposed upon certain notions, connected with its power of changing the condition of the atmosphere, during epidemics. Hence, in times of spreading sickness, it has been advised to light large fires with the view of destroying effluvia, which might be supposed to exist in the air. The coincidence that occurred between the last visitation of the plague in London, in 1665, and the great fire in 1666, has been esteemed, by some, to favor this view; but the invoked cause is insufficient to account for the effect. Although the heat might have destroyed the morbid miasms—which in the case in question is doubtful—it could not have prevented the recurrence of the evil. Its subsequent non-appearance seems to have been owing to other causes;—a better system of ventilation and draining was adopted; the streets were widened; common sewers were established; and paving was every where introduced;—circumstances that are adequate—even without the sanitary regulations, which were rigidly enforced, but whose agency was more than doubtful—to account for the change.

But, although heat can scarcely be used with advantage, for purifying districts suffering under epidemic or contagious maladies, there can be no doubt whatever, that it is capable of disinfecting confined spaces, and bodies imbued with morbid miasms. In some modern experiments, by Dr. Henry, of Manchester, England, he found, that substances, impregnated with the matter of contagion, and exposed to elevated temperatures,—namely, from 200° to 204° , for a considerable length of time,—were rendered incapable of communicating the diseases, even when they were clothes that had been worn during the whole period of a contagious malady. He inclosed the substances to be disinfected in air-tight canisters, and exposed them to dry heat for a certain time; and he esteems this process to be superior to exposing them to gases, inasmuch as these may be arrested by compressed materials, whilst no opposition can prevent the transmission of caloric. The agent, he employs for the transmission of caloric, is steam, and this is passed between the sides of a tinned copper box, and an outer case of the same material. The most delicate goods cannot be injured by the application of the degree of heat, disengaged by this means.

At one time, the mineral acid vapours—muriatic, nitric, and

'oxymuriatic,'—as it was then termed—were almost solely employed as disinfectants, and they are efficacious agents. For the discovery of the powers of the nitric acid, Dr. Carmichael Smythe received the disproportionate reward of ten thousand pounds from the British Parliament;—yet, strange to say, the chlorine has so completely taken its place, that we never hear, at the present day, of its employment.

All the gases are liable to the objection, that they are extremely irritating when respired; indeed, in a state of concentration they are completely irrespirable. They cannot, therefore, be used in the sleeping apartments of the sick, although they may be beneficially employed, after patients have been withdrawn, and the object is—to disinfect the chamber. They ruin all polished metallic surfaces, but this can be effectually obviated by painting them over with a compost of starch.

All the inconveniences, attendant upon the use of the acid gases, and of chlorine disengaged in the ordinary way, are obviated by using the chlorides—of lime and soda especially,—for the discovering of the disinfecting properties of which we are indebted to M. Labarraque—an ingenious French pharmacien—who, in the year 1824, fully established the title of the chlorides to the reputation of being our best disinfecting materials. In these preparations, the chlorine is retained by such a feeble affinity, that even the carbonic acid of the air is sufficient to displace it. The chlorine is, in this way, gradually given off, and the base unites with the carbonic acid to form a carbonate. All, that is necessary to be done, is—to expose the chloride of lime, or the solution of the chloride of soda in flat shallow vessels, in the sick room, as occasion may require. Indeed, aspersions with a solution, not containing more than one two hundredth part of the chloride of lime, have been found adequate to the disinfection of the wards of a large hospital.

Where bodies, which have remained for some time in the earth, have to be exhumed, the strength of the solution must be increased, and it may be well to dip a cloth in the liquid, and envelope the body in it, moistening the cloth occasionally with the solution. There is no object, requiring disinfection, for which the chlorides are not appropriate. Where excrementitious matters have to be retained in the bed chamber, the offensive odor is neutralized, by throwing one of the chlorides into the vessel, and around the chamber; and the great advantage of this mode of disinfection is, that it may be used in the chambers of the sick, without the disengaged chlorine exciting any inconvenience.

By these methods, morbid effluvia may be acted upon, and destroyed, and if due ventilation be practised, all the seeds of disease may be effectually removed.

Thus much as regards the agents, that are chiefly employed to disinfect the air of confined situations, or substances that have imbibed contagious effluvia. It yet remains to touch briefly on those agents, that are esteemed capable of removing any incipient, or fully formed, septic condition, in the living body, or in any part of it.

Connected with this subject, it is important to bear in mind the results of experiments, instituted by Dr. Stark, which shew, that when pieces of cloth, of different colours, are exposed to odorous particles emanating from bodies, some absorb a larger amount of particles than others. His experiments exhibit, that black and dark blue absorb twice as much as white, and he infers, with probability, that contagious emanations may be subject to similar laws with odorous emanations, and that, accordingly, in times of contagious maladies, black is the worst colour, that could be worn. "Next, therefore," he says, "to keeping the walls of hospitals, prisons, or apartments occupied by a number of individuals, of a white colour, I should suggest that the bedsteads, tables, seats, &c., should be painted white, and that the dresses of the nurses and hospital attendants should be of a light colour. A regulation of this kind would possess the double advantage of enabling cleanliness to be enforced, at the same time that it presented the least absorbent surface to the emanations of disease."*

The humorists of old believed, that the animal body can undergo putrefaction or a septic change, even whilst the principle of life is still pervading it, and many of their pathological notions were based upon the belief of such a conversion having taken place in the humors; but, in the sudden change from humorism to solidism, these notions were exploded, and it was considered the height of absurdity to believe such a thing practicable. The principle of life was conceived to counteract every septic tendency, and, indeed, to render any such condition impracticable.

Within certain limits, these views are accurate. We can scarcely imagine a condition of the living body, in which all its parts shall be putrid. Putrefaction cannot be fully formed, unless the principle of life is extinct; but, that a putrescent state

* 'Philosophical Transactions,' for 1833, and 'Elements of Hygiène,' p. 396.

may be present in the yet living body, is evidenced by numerous facts. The condition of the organism, in those fevers that have been called 'putrid,' in the worst cases of scurvy, and where individuals have been exposed, for a sufficient length of time, to a putrid atmosphere, sufficiently exhibits, that a septic change may be effected, between which, and putrefaction, the same relation may be conceived to exist, as between gangrene and sphacelus,—in the former of which the part may be considered in a state of suspended animation, admitting of resuscitation; whilst, in the latter, the principle of life is extinct, and the mischief, therefore, irretrievable. The analogy holds good, too, in a therapeutical relation. The remedies, that are appropriate in a case of gangrene, are equally indicated in putrescency of the system; whilst in fully developed putrefaction—as in sphacelus or true mortification or death of a part—no therapeutical agent can be possessed of any efficacy. Of the various signs of death—many of which are so equivocal—putrefaction is the most satisfactory; and when the ordinary signs of death have been wanting, it has been advised to keep the body above ground, until there could be no doubt, from the evidences of the senses, that the elements of the body were beginning to yield to the play of new affinities.*

Granting, that such a septic tendency may exist in the organism under particular circumstances, we can conceive, that antiseptics may be needed in two contingencies: *first*;—to obviate such septic tendency; and *secondly*, to correct the offensive character of any of the tissues or secretions, that may have become putrid, and thus prevent them from reacting on the system.

For fulfilling the first object, the most opposite management may be requisite in different cases. If we inquire into the causes of the positive death of parts—to which the name 'mortification' has been given,—we find, that they are numerous: they may consist in excessive action of vessels; in great irregularity of circulation, and innervation; in the use of certain agents as food,—the ergot of rye, for example; &c., &c.; and, accordingly, as the causes are various, the means, to be adopted for their removal, must be equally so. Hence, antiphlogistics may, in one case, be antiseptics; whilst in another, tonics and stimulants may be imperiously demanded.

It is not, however, to the agents just mentioned, that we ordinarily apply the term antiseptics. Its acceptation is usually

* 'Human Physiology,' 1st edit. ii. 518; and 2d edit. ii. 554.

confined to agents, which we employ when signs of putrescency or of decomposition have already manifested themselves, and when the object is both to destroy the offensive character of the tissues or secretions, and to arouse the vital energies, so as to enable the functions of nutrition to take fresh activity, and throw off the morbid and morbid degeneration. For this purpose, the different vegetable tonics, and especially the cinchona, with the mineral acids are generally exhibited, with the view of inducing a new action in the function of innervation, and, through the improved hæmatosis, to enrich the vital fluid, so that, when it reaches the capillaries,—under the amelioration, occasioned by these combined changes,—the organs of nutrition assume fresh activity, and if a portion of the organism has become dead, and consequently extraneous, a separation of the dead from the living portions is more readily accomplished. It is in this way, probably, that most of the internal antiseptics act; whilst, by passing into the mass of blood, and being exhaled through the different emunctories, they may, at the same time, correct any septic condition or tendency, which the different tissues or fluids may have acquired.

There are some antiseptics, however, whose action cannot be explained in this manner. It can obviously be invoked to account only for the *modus operandi* of such as enter—wholly, or in part—the bloodvessels. Charcoal probably exerts its efficacy altogether on the first passages, and through them on the rest of the frame. It is impossible to conceive, that it can act in any manner through the medium of the circulation: whilst the chlorides, mineral acids, creosote, &c., produce their effect in the compound mode, which I have attempted to describe.

In like manner, when these and other agents are applied externally to gangrenous or gangrenoid parts, their operation is equally complex. They first of all disinfect, by acting chemically on the parts with which they come in contact; and, as a general rule, they stimulate the vital energies of the tissues, until these assume a new action, and throw off the morbid condition and degenerations. It is with this view, that antiseptics are employed in gangrene, sphacelus, foul ulcers, &c., &c. Some of them would seem to act merely as disinfectants. Such is, probably, the case with charcoal. When applied to a gangrenous or sphacelated part, it scarcely, perhaps, retards the progress of putrefaction. It merely destroys the putrid emanations, and thus prevents them from reacting injuriously on the system.

T A B L E

OF THE CHIEF DISINFECTANTS, AND THEIR OFFICIAL PREPARATIONS.

A. DISINFECTANTS OF APARTMENTS, CLOTHES, ETC.

AGENT.	OBTAINED.	HOW USED.
Acidum Muriaticum. <i>Muriatic Acid.</i> (<i>The Fumes.</i>)	{ By mixing 12 p. of muriatic acid, with 15 of the muriate of soda, moistened before the acid is added. }	Placed in shallow vessels in the room.
Acidum Nitricum. <i>Nitric Acid.</i> (<i>The Fumes.</i>)	{ By mixing equal parts of nitrate of potassa and sulphuric acid, ($\frac{1}{2}$ oz. of each disinfects 1000 cubic feet of air.) }	Do.
Acidum Sulphurosum. <i>Sulphurous Acid.</i> (<i>The Fumes.</i>)	{ By burning sulphur. }	
Chlorinum. <i>Chlorine.</i> <i>Ozymuriatic Acid Gas.</i>	{ By mixing one part of dry chloride of sodium; one part of peroxide of manganese, and two parts of sulphuric acid, with one part of water, ($\frac{1}{2}$ pound of each of the first; and a pound of the last article will disinfect 288,714 cubic feet of air.) }	Do.
Calcis Chloridum. <i>Chloride of Lime.</i> <i>Ozymuriate of Lime.</i> <i>Bleaching Powder.</i>	{ On the small scale, by passing chlorine through pulverulent hydrate of lime as long as it continues to be absorbed. }	Do. Also, sprinkled in solution on the floor, or on the substance to be disinfected.
Sodæ Chloridum. <i>Chloride of Soda.</i> <i>Labarraque's Disinfecting Liquid.</i>	{ By passing chlorine through a solution of soda; or by decomposing the chloride of lime by the carbonate of soda. }	Do.
Caloric.....	.....	{ By heating the clothes or other substances by dry caloric, in air-tight boxes, by means of steam, to 200 or 210° Fahrenheit.

B. DISINFECTANTS OF THE LIVING BODY.

(*Antiseptics.*)

AGENT.	OBTAINED.	FORM OF PREPARATION.	HOW USED.
Acidum Muriaticum. <i>Muriatic Acid.</i>	{ By the action of sulphuric acid on chloride of sodium. }	.....	{ In the dose of m. 10 to 20 in malignant typhus, scarlatina, etc.; also, in gargle, (f. dr. $\frac{1}{2}$ to dr. 1 $\frac{1}{2}$; to aq. f. oz. 6;) and as a wash in foul ulcers, diluted with water.

AGENT.	OBTAINED.	FORM OF PREPARATION.	HOW USED.
Acidum Nitricum. <i>Nitric Acid.</i> (See Table of Tonics.)	}	<i>Internally</i> as a tonic; <i>externally</i> as a lotion to fetid ulcers, (m. 12 to 20, to aq. O i.)
Acidum Sulphuricum. <i>Sulphuric Acid.</i> (See Table of Tonics.)			<i>Internally</i> , as a tonic; <i>externally</i> , diluted with water, as a lotion to fetid ulcers, etc.
Carbo Ligni. <i>Charcoal.</i> (See Table of Tonics.)			<i>Internally</i> , as a tonic; and as an antiseptic, in cases of fetid breath, fetid eructations, etc. Dose m. 10 to dr.
		Cataplasma Carbonis Ligni. (Charcoal powder, fresh prepared, mixed with flaxseed meal or meal and water.)	In foul and gangrenous ulcers.
Calceis Chloridum. <i>Chloride of Lime.</i> (See above.)	}	In solution, in cases of foul ulcers, and as a gargle in malignant sore throat, (dr. 1 to dr. 3, to aq. O. i.)
Chlorinum. <i>Chlorinum.</i> (See above.)			
		Aqua Chlorini. (Water saturated with chlorine.)	<i>Internally</i> , m. 6 or 8 in malignant typhus, etc.; also, in cases of fetid breath and fetid eructations; as a gargle in putrid sore throat; and as a wash in malignant ulcers.
Cinchona,—its active principle, quinine, and the tonics in general. (See Table of Tonics.)	}	Administered internally, as well as externally. A cataplasm of the powdered bark is often applied to foul, gangrenous parts, etc.
Creosote. (See Table of Astringents.)			<i>Internally</i> , as well as in the form of lotion. (See Table of Astringents.)

AGENT.	OBTAINED.	FORM OF PREPARATION.	HOW USED.
Dauci Radix. <i>Garden Carrot Root.</i> (The root of the <i>Daucus Carota</i> .)		Cataplasma Dauci. <i>Carrot Cataplasma.</i> (Boiled in water, until it has the requisite softness.)	Applied to ill conditioned, offensive ulcers.
Fermentum Cerevisiæ. <i>Yeast.</i> (Acts probably by the <i>Carbonic acid</i> , and the bitter of the hops.)		Given internally in typhus, malignant scarlatina, etc.
		Cataplasma Fermenti. (Made of flour, or meal and yeast.)	To foul gangrenous ulcers.
Sodæ Chloridum. <i>Chloride of Soda.</i> (See above.)		Dose, m. 15 to 25 of the solution. Used internally and externally in the same cases as the calceis chloridum: as a lotion, diluted with from 10 to 40 parts of water.

CHAPTER VII.

MECHANICAL AGENTS.

Modus operandi of mechanical agents—May affect the vital operations—
The least important of our therapeutical resources.

SIMILAR remarks to those, that were indulged, under the great division of 'chemical agents,' are equally applicable here. Although the classes, commonly ranked under the head of mechanical agents, may exert many of their properties in a purely mechanical manner, they still affect the vital properties of the tissues and secretions—often markedly. In no other way, indeed, can we explain the effect of a demulcent, when given to allay irritation of the lining membrane of the air passages. The substance can come in contact only with that part of the pulmonary or gastro-pulmonary mucous membrane, which invests the top of the larynx. The portion of the membrane, actually affected with inflammatory irritation, can in no wise be reached by it; yet, its effects are unequivocal; a soothing influence is exerted, and the cough, which is nothing more than a symptom of bronchitic affection, is allayed. Many of the other agencies of demulcents, when used for the removal of internal disease, are equal exemplifications of the modification impressed upon the vital operations; and, therefore, in strictness of language, neither of the classes, usually ranked under this division, ought to be exclusively consigned to it, notwithstanding, that some of their operations may be wholly mechanical;—as where a demulcent is used to shield or varnish an inflamed part, or a diluent to render less irritating any morbid secretion or deleterious substance.

Mechanical agents are generally esteemed the least important of our therapeutical resources, and perhaps they may be so. There are many morbid conditions, however, which admit of manifest relief from them, and, occasionally, all our therapeutical endeavours are restricted to their employment.

SECTION I.

DEMULCENTS.*

Definition of demulcents—Of emollients—Not remedies of any activity—
Therapeutical application—Are digested in the stomach—Therapeutical use of emollients—Table of demulcents.

By most writers on therapeutics, the class of 'demulcents' has been separated from that of 'emollients';—the former being made to comprise those agents "which are capable of shielding sensible surfaces from the action of acrid matter, by involving it in a mild and viscid medium;" whilst the latter includes—"substances, whose application diminishes the force of cohesion in the particles of the solid matter of the human body, and thereby renders them more lax and flexible."† Their consideration, however, embraces so many points in common, that it may be well to keep them united; bearing in mind, at the same time, that they are capable of producing the effects comprised in both of the above definitions, and that they are often employed accordingly. Dr. Thomson uses the class of demulcents synonymously with emollients and relaxants, and defines them "substances, which diminish the vital tension of tissues and lessen acrimony by lubricating, softening, and rendering more flexible the solid part of the body."‡

Demulcents—as employed for the first of the purposes, referred to by Paris—are not remedies of any activity; but they are agents, that may be invoked, with advantage, in the various forms of disease, to which the French have appropriated the

* Emollients, relaxants; from *demulcere*, 'to soothe.'

† Paris's '*Pharmacologia*, Edit. cit. p. 141.

‡ Op. citat. ii. 622.

name 'catarrh;'—that is, in increased discharges dependent upon inflammatory or other irritation of the mucous membranes. Yet, their efficacy must obviously differ somewhat, according to the facility with which they may be made to come in contact with the seat of the increased discharge, or of the inflammatory irritation of the membrane. Accordingly, in gastro-enteritic affections, perhaps, they are most beneficially employed, and, since the views of Broussais have been in the possession of the medical world, demulcents have been more frequently used than formerly. It has been a reproach, indeed, against the medical practice of that celebrated systematist, that he confines his remedial efforts, too frequently, to shielding or varnishing the lining membrane of the stomach, by the substances belonging to the class we are considering; but, whatever doubt may be indulged, respecting the effects of the demulcent, in such cases, there can be but little, that its use occasionally prevents the practitioner from the adoption of more perturbing means, and therefore that the demulcent medication is often negatively of essential utility.

Even where the enteric affection is seated lower down the tube than in the portion, which suffers under the gastro-enteritis of Broussais, demulcents may be useful. Where it is in the mucous membrane of the stomach, the demulcent has its nature and action unchanged; but, where the *foyer* of the disease is lower, the agent undergoes either stomachal or duodenal digestion, or both; and therefore, its *modus operandi* must be modified. In the latter case, the soothing effect is exerted on the membrane lining the supradiaphragmatic portion of the tube, and the stomach; and, by continuous sympathy, the effect is propagated along the membrane to the portion affected by the inflammatory irritation.

It is in this mode, that the dietetic demulcents may be serviceable in enteritis, even when it is seated far down the tube—as in the mucous membrane of the large intestines, in cases of dysentery. They exert an immediately soothing influence on the gastric mucous membrane, and, in addition, the excrementitious portion, which is sent on through the canal, is as devoid of irritating qualities as any fæcal matter whatever. Hence, the farinaceous decoctions—as of arrow-root, sago, tapioca, &c., become not only dietetic, but medicinal agents, belonging to the class under consideration; and they are placed by Dr. A. T. Thomson in his class of demulcents.

These are cases, in which the remedial agent is made to come in contact—directly or indirectly—with the diseased part; and it will be readily understood, that the remarks apply to every condition of the gastro-pulmonary mucous membrane, or, indeed, of any mucous membrane, where similar circumstances exist; but, not unfrequently, demulcents are prescribed for affections of mucous membranes with which they cannot be brought into immediate contact—or, perhaps, into contact at all—inasmuch as they must previously pass into the circulatory torrent, and be eliminated by some emunctory, before they can attain the seat of the disease. Such must be the case, where demulcents are administered by the mouth, for the cure of affections of the urinary organs. To produce any effect, they must enter the circulation unchanged. This, we have seen, is not the case; and, much as it conflicts with vulgar belief, and even with the opinions of many practitioners, it may be laid down as a fact,—that the different mucilaginous drinks—as of gum water, flaxseed tea, &c., administered in gonorrhœal and other inflammatory irritations of the urinary organs—exert no more remedial agency than so much pure water. They act altogether as diluents. The mucilage is digested, and goes to the formation of the chyle, being taken up by the chyliferous vessels in the small intestines; whilst the water, with which the mucilage was combined, enters the abdominal venous system by imbibition. Such is probably the fact. It is the inference I have deduced from repeated examination of the urine, when mucilaginous drinks have been freely taken; and the same deductions have been made from similar observations by Dr. Paris. “In parts,” he observes, “beyond the reach of the first passages, and to which no fluid can arrive but through the medium of the secretions, it is very difficult to explain the principle upon which their beneficial operation can depend; and it seems indeed highly probable that they act in such cases as simple diluents, for the process of digestion must necessarily deprive them of their characteristic viscosity. The administration of demulcent drinks in gonorrhœa is probably of no further service, in assuaging the *ardor urinæ*, than an equivalent quantity of pure water; although Dr. Murray observes, ‘it is sufficiently certain that many substances which undergo the powers of digestion, are afterwards separated in their entire state from the blood, by particular secreting organs; and there is,’ continues he, ‘no gland which has this power more particularly than the kidneys; substances, received into the stomach and digested afterwards, passing off in the urine with

all their peculiar properties.' This is undoubtedly very true; but mucilaginous substances rarely or never pass off in this manner; if they evade the assimilative functions, they pass through the alimentary canal, and are thus eliminated. I can state, as the result of experiment, that the urine undergoes no change, except in the relative proportion of its water, by the copious and repeated administration of mild mucilages. Dr. Saunders has very justly remarked, that "the long list of ptisans, decoctions, &c., usually prescribed upon these occasions, generally owe their virtues to the watery diluent itself."*

Yet it is hard to abandon opinions, that have been cherished for ages, and are apparently supported by 'experience;' and hence we occasionally witness attempts made to support the practice by the notion, that a part of every demulcent escapes digestion, and enters the current of the circulation. "But substances," says Professor Thomson, "that produce a demulcent effect are taken into the stomach, and apparently act upon distant organs. A question arises, suggested by the nature of the substances, what effects has digestion upon them? Undoubtedly, a large portion of almost every demulcent taken into the stomach is digested; but some part of them, at least, escapes this process, and is carried into the system."†

But even if we admit, that a small portion of the demulcent *may* pass into the system—of which, however, we have no evidence—we are amply justified in inferring, that the quantity must be too minute to exert any influence upon distant organs; that, consequently, whatever effect is induced is through the agency of the water, with which the demulcent is combined, and that the demulcent itself acts, in such cases, as a simple nutrient only.

Next to affections of the lining membrane of the digestive apparatus, those of the membrane lining the air passages are most frequently treated—along with other agents, according to the greater or less urgency of the case—by demulcents. In these affections, it would not seem, that much advantage ought to be expected from such agents, unless the inflammatory irritation were seated so high up in the larynx, that the demulcent could come in contact with it; but experience shews, that here, as in inflammatory irritations of the lower part of the intestinal tube, benefit may be derived through the means of continuous sympathy;—that is, by soothing the top of the larynx, the sa-

* · Pharmacologia,' p. 139.

† Op. citat. p. 623.

lutory influence may be extended lower down, and may relieve the cough, although the seat of the pathological affection, which occasions it, may be in the minute bronchial ramifications. Hence it is, that emulsions, mucilages, syrups, troches, &c., are so commonly prescribed, with benefit, in cases of cough.

As regards 'Emollients,' or agents whose application diminishes the force of cohesion in the particles of the solid matter of the body, and thereby renders them more lax and flexible,—much of their operation must, obviously, be mechanical. When we rub an emollient substance into a part, which is unusually rigid, the substance insinuates itself between the particles of the tissue, which thus becomes softened and relaxed. Yet, even here, some degree of vital action may be caused by the remedial agent, and a soothing influence be exerted, which may reduce the tension of the organs, in some measure, through the functions of innervation and circulation of the part. One of the most common cases for the employment of emollients is during the progress of a physiological process. When the perinæum, in parturition, is more than usually rigid, and does not yield readily to the pressure of the head of the child, the obstetrical practitioner frequently recommends, that lard should be freely rubbed on the perinæum, or that the female should sit over the steam of hot water. Often, perhaps, not much effect is exerted by this agency, but, at times, relaxation of the parts and delivery would seem to be expedited by it. In like manner, when severe sprains have been received, we have recourse to immersion of the parts in warmth and moisture. It is well known, that where swelling speedily succeeds any violent torsion of the joints, the pain is by no means so severe as when the same extent of mechanical injury is inflicted without an equal amount of tumefaction. It would seem, therefore, that if we could facilitate this tumefaction, in any manner, we might afford relief. Accordingly, in severe sprains of the ankle, if we advise that the extremity be kept for some time in warm water, we are often gratified to discover, that the agony is rapidly mitigated.

It has been properly remarked, that although we may be disposed to consider the principal—if not the whole—of the operation of emollients, in the cases alluded to, to be of a mechanical character, the beneficial effects of cataplasms and fomentations cannot be so explained; "for, in these instances, none of the materials can be absorbed through the entire cuticle; and yet the relaxation and consequent ease, which such warm applica-

tions produce on inflamed surfaces, is very considerable, but it must be wholly attributed to the relaxing effects of warmth and moisture upon the extreme vessels of the surface, propagated by *contiguous sympathy* to the deeper seated organs.”*

I have, in a previous part of this volume, referred to the effects, which caloric, in different degrees of intensity, is capable of producing, and have remarked, that its agency is various according to the temperature:—heat, greater than that of the human body, stimulating; whilst one lower than that of the body is soothing and sedative. According, therefore, to the degree of heat, will be the effect produced on the vital functions. In inflammations of deep seated organs—as of the peritoneal coat of the intestines—a hot fomentation, although it may excite the organic actions of the part, with which it is made to come in contact, may act as a revellent, and, in this way, be beneficial like other revellents; whilst a warm fomentation, by virtue of the soothing and relaxing influence of the warmth and moisture, may—through the extensive sympathy that exists between every part of the capillary system—have its soothing influence extended to the capillaries, that are under inflammatory excitement. It may be asked, however, whether, in this case, the inflammation is relieved by contiguous sympathy, or by the general effect, which the relaxant application exerts on the whole capillary system of vessels. It is probable, that the result is produced in both ways. From what I have elsewhere remarked, the sedative influence, occasioned by the abstraction of caloric from a part of the frame, in cases of that excited condition of the organic actions, which constitutes fever, is as effectually and surely exerted, as when the cooling medium is made to come in contact with the whole cutaneous surface. In internal inflammations, the use of soothing fomentations and cataplasms may have a like agency; but a part of the effect is, doubtless, also produced on the suffering organ, through the sympathy of contiguity, although this may not be so much concerned in the curative operation as has been imagined. In the case assumed—of inflammation of the peritoneal coat of the intestines—the capillaries, affected by the disease, and by the local application, have nothing in common. The whole of the anatomical elements are as different as if the remedy were placed upon one of the extremities, and yet the effect is often signal; the main result is manifestly one of revulsion,—the new impression, made on the or-

* Paris, Op. citat. p. 141.

gans of circulation and innervation of the part, detracting from the concentration of the vital manifestations existing elsewhere.

Lastly, in the *modus operandi* of emollient cataplasms, in external inflammation, we have an example of a more complex agency than might, at first sight, appear. Although the warmth and moisture, doubtless, act mechanically, and diminish the cohesion of the parts, the sanative effect is not owing to this circumstance, but to the soothing influence, before referred to. Hence, a warm cataplasm or fomentation is a valuable remedy in many cases of external phlegmasiæ, even from their very inception. When such inflammation is apt to terminate in suppuration, those applications are universally had recourse to, and as they seem to favour suppuration, they have—by the unprofessional especially—been esteemed improper in ordinary cases of external inflammation, in which suppuration is not threatened, or not to be encouraged. The opinion is, however, erroneous. The effect of the warmth and moisture of the cataplasm is, in both cases, soothing. In the commencement, therefore, of inflammation, it is a useful agent; and, when the organic actions of the part are so over excited, as to threaten some of the less favourable terminations of inflammation, it reduces them to that point, which is requisite for the existence of suppurative action. The vulgar believe, that a cataplasm, in such case, is ‘drawing,’ and that it thus expedites the pointing of the abscess. The *modus medendi* is the one I have given. The cataplasm, or the fomentation acts by virtue of its warmth and moisture. Both lessen organic actions, when inordinately exalted; both diminish cohesion in the parts to which they are applied; and by virtue of this relaxant property, if their application be too long continued, they often occasion sloughing of the integuments, and extensive scars. This is not unfrequently the case in inflammation of the mammæ ending in suppuration; and, therefore, it is wise to be careful as regards their too protracted use; otherwise, the tone of the bloodvessels may be destroyed; the inconveniences, I have depicted, be experienced, and convalescence be tedious and distressing.

TABLE

OF THE CHIEF DEMULCENTS, AND THEIR OFFICINAL PREPARATIONS.

A. INTERNAL.

AGENT.	OBTAINED.	FORM OF PREPARATION.	USED.
<p>Acaciæ Gummi. <i>Gum Arabic.</i> (The concrete juice of the <i>Acacia Vera</i>.)</p>	<p>From Egypt.</p>	<p>A mucilaginous drink may be formed, by dissolving an ounce of the gum in a pint of boiling water.</p> <p>Mucilago Acaciæ. (P. gum.acaciæ oz. 4; aq. bullient. O ½. ... Chiefly used to suspend insoluble substances in water.)</p> <p>Syrupus Acaciæ. (Gum. acac. oz. 4; sacch. lb. 1; aq. bullient. O i. Boil to form a syrup.)</p> <p>Trochisci Gummosi. (Gum. acaciæ p. 4; amyli p. 1; sacchar. purif. p. 12. Make into troches with rose water.)</p>	<p>As drink and food in gastritic affections especially.</p>
<p>Althææ Folia et Radix. <i>Leaves and root of the Marshmallow,—the Althæa Officinalis.</i></p>		<p>Decoctum Althææ. (Althææ fol. et rad. oz. 4; uvar. pas-sar. oz. 2; aq. O vii. Boil to O v.</p> <p>Syrupus Althææ. (Rad. althææ. recent. lb. ½; sacch. purif. lb. 2; aq. O iv. Boil the water—with the root—to one half. Add the sugar and form a syrup.</p>	
<p>Amygdalæ. <i>Almonds.</i> (The kernels of the <i>Amygdalus Communis</i>.)</p>	<p>From Spain and the South of France.</p>	<p>Confectio Amygdalæ. (Amygdal. oz. 1; p. g. acac. dr. 1; sacch. purif. oz. ½. Blanch the almonds, and mix thoroughly.)</p> <p>Mistura Amygdalæ. <i>Almond Mixture.</i> <i>Almond Emulsion.</i> (Confect. amygd. oz. 1; aq. distil-lat. O ½. Mix and strain.)</p> <p>Oleum Amygdalæ. (The fixed oil of the kernels.)</p>	<p>For making the emulsion.</p> <p>Dose, f. oz. 1 ½ to f. oz. 6.</p> <p>Sometimes mixed with syrup, in catarrhs of children; also, formed into an emulsion by means of mucilage, the yolk of egg, or an alkali. Added, at times, to enemata.</p>

AGENT.	OBTAINED.	FORM OF PREPARATION.	USED.
Amylum. } Starch. }	{ From the <i>Triticum</i> <i>Hybernum</i>. }	.....	{ Sometimes as an absorbent, in the form of hair powder.
		Mucilago Amyli. (Amyli dr. 3; aq. O i. Rub to- gether and boil to make a mucilage.)	{ As a demulcent enema; and as a vehicle for an o- piate enema.
Avenæ Farina. Oatmeal. (The meal of the <i>Ave- na Sativa</i>).	{ .....	.....	{ As a vehi- cle for emolli- ent enemata.
Cera. Wax. Cera Alba et Cera Flava. White Wax and Yel- low Wax. (The former is the latter bleached.)	{ .....	.....	{ White wax is sometimes given in diarrhœa and dysentery, melt- ed with olive oil, and formed into a mucilage.
Myrtle Wax.....	{ By boiling the berries of the <i>Myrica Cerife- ra</i> , of the U. States, in water, and skimming off the wax. }	.....	{ In diarrhœa & dysentery. Dose a teaspoonful, mixed with mu- cilage or syrup.
Cetaceum. Spermaceti. (A peculiar con- crete substance.)	{ From large cavities in the head of the <i>Phy- seter macrocephalus</i>. }	.....	{ Suspended by means of mucilage, or the yolk of egg.
Cydoniæ Semina. Quince Seeds. (The seeds of the <i>Py- rus Cydonia</i>).		Decoctum Cydoniæ. (Cydon. semin. dr. 2; aquæ O i. Boil for ten minutes, and strain.)	
Glycyrrhiza. Liquorice Root. (The root of the <i>Gly- cyrrhiza Glabra</i> .)		Decoctum Glycyrrhizæ. (Rad. glycyrrh. cont. oz. 1½; aq. O i. Boil for ten minutes and strain.) Extractum Glycyrrhizæ. <i>Liquorice</i> . (The extract of the root of the <i>Gly- cyrrhiza glabra</i> .) Trochisci Glycyrrhizæ Glabræ. (Ext. glycyrr.; gum. acac. ana p. 1; sacch. purif. p. 2; aq. bullient. q.s. Evaporate, so as to form troches.) Trochisci Glycyrrhizæ et Opii. (See Table of Narcotics.)	{ Each troche contains about one-seventh of a grain of opium.
Hordeum. Barley. (The decorticated seeds of the <i>Hor- deum distichon</i>).			

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Lichen. Iceland Moss. (The <i>Cetraria Islandica</i> , or <i>Lichen Islandicus</i> ,—the plant.)	.....	Decoction Hordei. (Hordei perlati (<i>Pearl Barley</i>) oz. 2; aq. O 4½. Wash away extraneous matters with cold water. Pour on aq. O ½, and boil for a short time. Throw this away; pour the re- mainder—boiling hot—on the bar- ley; boil to O ij. and strain.)	The powder, sometimes. Dose dr. ½ to dr. 1.
		Decoction Hordei compositum. (Decoct. hordei O ij.; ficor. oz. 2; rad. glycyrr. oz. ½; uvar. pass. oz. 2; aq. O i. Boil to O ij. and strain.)	
The Carrageen or Irish Moss— <i>Chondrus Crispus</i> —pos- sesses like virtues.		Decoction Lichenis. (Lichen. oz. 1; aquæ O 1½: Boil to O 1, and strain with compression.)	Dose O i. or more in the 24 hours.
Linum. Flaxseed. (The seeds of <i>Linum</i> <i>Usitatissimum</i> .)		Infusum Lini. (Sem. lin. oz. ½; rad. glycyrr. cont. dr. 2; aq. bullient. O i; macerate for four hours, and strain.)	
		Oleum Lini. (The expressed oil of the seeds.)	Sometimes in enemata.
Olivæ Oleum. Olive Oil. (The oil of the fruit of the <i>Olea Euro- pæa</i> .)	From the South of France.	.....	Sometimes with syrup in ca- tarrhs of chil- dren, especial- ly;—also, form- ed into an emul- sion, by means of mucilage, yolk of egg, or an alkali. Ad- ded, at times, to enemata.
Sassafras Medulla. Sassafras Pith. (The pith of the stems of the <i>Laurus Sas- safir</i> . Indigenous.)	.....	.....	A drachm of the pith to a pint of boiling water makes a pleasant demul- cent drink.
Sesamum. Benne. (The leaves of the <i>Ses- samum Orientale</i> .— Indigenous.)	.....	.....	One or two fresh leaves stir- red about in O ½ of cool water, render it suffi- ciently viscid.— When dried, they must be put into hot wa- ter.
		Oleum Sesami. Benne Oil. (The expressed oil of the seeds.)	Like the al- mond or olive oil.

AGENT.	OBTAINED.	FORM OF PREPARATION.	USED.
Serum. <i>Suet.</i> (The prepared suet of the sheep— <i>Ovis</i> <i>aries.</i>)	From India and the Levant.		Boiled with milk, in diar- rhœa and dy- sentery.
Tragacantha. <i>Tragacanth.</i> (The concrete juice of the <i>Astragalus</i> <i>Verus</i> , of Persia.)		Mucilago Gummi Tragacanthæ. (Pulv. Tragac. dr. 2; aq. bullient. O $\frac{1}{2}$. Macerate and strain.) Pulvis Tragacanthæ compositus. (Pulv. tragac., gum acac., amyli ana oz. $1\frac{1}{2}$; sacch. purif. oz. 3.)	gr. 10 to dr. 1. gr. 30 to dr. 1.
Ulmus. <i>Slippery Elm Bark.</i> (The liber of the <i>Ulmus</i> <i>Fulva</i> . Indige- nous.)		Infusum Ulmi. (Ulm. incis. oz. 1; aq. bullient. O 1. Macerate for 12 hours, and strain.	ad libitum.

B. EXTERNAL.—EMOLLIENTS.

Adeps. <i>Lard.</i> (The fat of the <i>Sus</i> <i>Scrofa</i> , or common hog.)		Ceratum Simplex. (Adipis oz. 8; ceræ albæ oz. 4.) Unguentum Aquæ Rosæ. <i>Cold Cream.</i> (Aq. rosæ, ol. amygdal. ana f. oz. 2; cetacei oz. $\frac{1}{2}$; ceræ albæ dr. 1.— Melt the other ingredients toge- ther; add the rose water, and stir till cold.) Unguentum Simplex. (Ceræ albæ lb. 1; adipis lb. 4.)	In the way of friction.
Amygdalæ Oleum. <i>Oil of Almonds.</i> (See above.)		Unguentum Aquæ Rosæ. (See above, under <i>Adeps.</i>)	In the way of friction.
Avenæ Farina. <i>Oatmeal.</i> (See above.)			As a cataplasm, when boiled with water into a thick paste.
Cera. <i>Wax.</i> (See above.)		Unguentum Simplex. (See above, under <i>Adeps.</i>)	
Cetaceum. <i>Spermaceti.</i> (See above.)		Ceratum Cetacei. (Cetacei oz. 1; ceræ alb. oz. 3, ol. oliv. oz. 6.)	
Linum. <i>Flaxseed.</i> (See above.)			As a cataplasm, —the meal be- ing mixed with hot water.

AGENT.	OBTAINED.	FORM OF PREPARATION.	DOSE.
Olivæ Oleum. Olive Oil. (See above.)	}	Oleum Lini. (The expressed oil of the seed.) Chiefly employed in the following formula.	{
		Linimentum Calcis. (Aquæ calcis, ol. lini ana f. oz. 1.)	
Sesamum. Benne. (See above.)	}	Linimentum Simplex. (Ol. oliv. p. 4; ceræ albæ p. 1.)	{
		Oleum Sesami.....	
Tritici Farina. Wheaten Flour. (See above.)	}	}	{
Ulmus. Slippery Elm Bark. (See above.)	}	}	{

In the way of friction.

The leaves, in the formation of emollient cataplasms.

Like the olive oil.

Wheatenbread, boiled with milk, is the most common emollient poultice.

As an emollient application; the bark being softened by boiling, or the powder, mixed with hot water.

SECTION II.

DILUENTS.

Necessity for drinks—Therapeutical use—Their absorption prevented by certain circumstances—Employment in dropsies, diseases of the urinary organs, &c.

A SLIGHT observance of the habits and instincts of man sufficiently shews, that drinks or liquids are more imperiously demanded by him, in the way of food, than solids. This is owing to the constant drain of fluid from the system by the various secretions—the pulmonary and cutaneous transpirations, the urine, &c.—and of the large proportion, which the fluids, composing the animal body, bear to the solids.

The necessity for the ingestion of fluids is indicated by thirst,—an internal sensation, in its essence resembling hunger, although not referred to precisely the same organs. The desire, however, can be much modified by habit; for, whilst some individuals require several gallons a day to satisfy their wants; others, who, by resistance, have acquired the habit of using very little liquid, enjoy good health, and do not experience the slightest inconvenience from its privation. This privation, it is obvious, cannot be absolute, or pushed beyond a certain extent. There must always be fluid enough taken to administer to the necessities of the system.

That the sensation of thirst is often greatly dependent upon the quantity of fluid, circulating in the vessels, is shewn by the fact, mentioned by Dupuytren, that he succeeded in allaying the thirst of animals, by injecting milk, whey, water, and other fluids into the veins; and Orfila states, that, in his toxicological experiments, he frequently quenched, in this way, the excessive thirst of animals, to which he had administered poison, and which were incapable of swallowing liquids, owing to the œso-

phagus having been tied. He found, also, that the blood of animals was more and more deprived of its watery portions, as the abstinence from liquids was more prolonged.*

Generally, however, the desire for liquids is, within certain limits, an artificial appetite, and, like the desire for solid food, is greatly regulated by the habits of the individual. So powerful, indeed, is the force of custom, that if a person were to habituate himself to take a glass of water every day, at a certain hour, the desire would recur daily, with all the force of a primitive instinct.

Often, too, thirst is present in conditions of the system, where we have no reason to presume, that there is a want of fluid, and where it is produced by morbid influences of a totally different character. It becomes, under such circumstances, a symptom of disease, and is one of the most prominent evidences of every kind of febrile and inflammatory indisposition; although, like each of the most marked symptoms of such indisposition, it may be occasionally wanting. The value of drinks, in such cases, is not dependent upon their action as diluents; and, consequently, in this point of view, they do not belong, in strictness, to this division of our subject. The thirst is owing to the excitement of the organic actions in the mucous membrane of the digestive tube, and the good effects of the fluid taken are dependent upon its possessing a temperature calculated to allay such excitement. Hence it is, that cold drinks are greedily sought after, and that warm fluids do not furnish the same marked relief. In this way, cold water, or any cold drink, acts as a refrigerant, and its *modus operandi* has accordingly been considered under another head. Water—the chief constituent of all drinks—is an essential component of every circulating fluid, and modern experiments have shewn, that it penetrates most, if not all, animal tissues better than any other fluid whatever; and, consequently, passes through them readily, to accumulate in any of its own solutions,—as in the blood; but, whenever there is a high degree of exaltation of organic actions in the mucous membrane of the alimentary canal, absorption is by no means readily affected; even the physical phenomenon of endosmose appears to be materially retarded. Hence—as I have previously shewn—it is difficult to bring the system under the influence of mercury, in those low typhoid conditions, in which there is frequently elevation of the organic actions of the lining membrane

* ‘Elements of Hygiène,’ p. 324: and ‘Human Physiology,’ 1st edit. i. 515; and 2d edit. i. 534.

of the intestines. The same remark has been made respecting the function of intestinal absorption in malignant cholera. Although attempts have been frequently made to affect the system with mercury, and, by administering saline solutions, to produce some change in the condition of the circulating fluid, it is extremely doubtful, whether, during the violence of the disease, any absorption has been effected; and, in many cases, the agents would seem to have remained in the intestinal canal until the disease had become somewhat mitigated; after which absorption was resumed, and their effects then became apparent. In other—and the generality of—instances they have passed through the bowels unchanged. A medical gentleman informed me, that a practitioner, during the prevalence of cholera, was speaking to him of the very great extent to which he had given calomel in the disease. “Well,” said my friend, “and what became of this enormous quantity of the mercurial?” “Why, it passed through the bowels like so much cornmeal!” Now, it is not easy to see what could have been the agency expected from large doses of a substance, which was visible in the evacuations in such quantity. The fact, however, demonstrates the truth of the remark I have made,—that absorption is, in these cases, almost null, and that calomel, like other agents, produces no effect upon the system, until some degree of recuperative energy has been awakened. Another medical friend informed me, that he had given to each of two individuals, who had recovered from cholera, an ounce of calomel, yet no mercurial influence, as indicated by the ordinary evidences, was exhibited.

But if the passage of diluents into the bloodvessels be retarded by any powerfully excited condition of the mucous membrane, it is largely facilitated by any circumstances, that give occasion to a diminution in the quantity of the circulating fluid. On this, however, I have said so much, under the head of ‘sorbefacients,’ that it is not necessary I should dwell here. I may remark, however, that the deficiency of the serous portions of the blood, in most cases of malignant cholera, and the consequent inspissation of the remainder, has suggested the injection of saline solutions into the bloodvessels; but the remedy has not answered the purpose. It may have diluted the blood: but it has not removed the more important mischief,—the cause, that gave occasion to the profuse separation of the watery portions.

It has been a question of some importance, whether diluents should be freely allowed in cases of dropsy. Without repeating what I have before said, on the pathology of that affection, it

would seem proper not to allow fluid too freely, unless as a vehicle for diuretics. Where increased exhalation occurs into any cavity, a corresponding diminution must take place in the mass of the circulatory fluids; and if tenuous fluids be freely permitted, the amount may be made up, and the dropsical accumulation be favoured. It is, consequently, better to allow the patient, for common drink, a solution of the bitartrate of potassa, which, when flavoured with lemonpeel and sweetened, proves a grateful diuretic drink, and yet, as it is medicated, there is not so much danger of its being taken to an injurious extent.

Great difference—irrational difference—of sentiment has existed, as regards the proper quantity of drink or of diluents, most favourable to digestion. In strictness, this is a question of Hygiène, but it interests the dyspeptic therapeutically also. Where the salivary and other secretions are too sparing to communicate to solid food the due digestive texture, liquids, in proper quantity, favour the gastric operations; but, if they be taken too freely during a meal, the texture is rendered too soft, and the gastric secretions are so much diluted, that digestion is more difficult. Hence it appears, that an error in quantity, at either extremity of the scale, should be avoided. In many places, it is the custom to hand round lemonade, wine, toddy, punch, &c., before dinner; but the dyspeptic must carefully eschew them. With many, they cause acidity, and, before the individual sits down to his repast, the stomach is in a very unfit state for the reception of the various articles sent into it at a fashionable dinner party.*

Where acrid or poisonous substances have been swallowed, dilution is generally indicated, but discrimination is here required. Some substances act more violently when in a state of solution, and hence 'dry vomiting' is advisable to get rid of them; or, if diluents be permitted, they must be removed again, as speedily as possible, by the stomach pump, or by one of the direct emetics; but, where the poison is a simple acrid, no doubt can exist regarding the propriety of dilution, and we generally have recourse to agents, belonging to the class last considered, which not only dilute the deleterious article, but shield the parts from its injurious contact.

In diseases of the urinary organs—especially in such as are of an inflammatory nature—diluents are largely used. I have before remarked, that in such cases demulcents act as mere di-

* 'Elements of Hygiène,' p. 329.

luents ; but the use of the former class is universal. By weakening the saline compound, which constitutes the urine, diluents prevent the irritation, that would otherwise be produced in the inflamed parts, during the passage of that fluid, and hence they are much used in *ardor urinæ*, which term—as I have before remarked—is appropriated to a symptom,—the disease consisting in an inflammatory state of the lining membrane of the urethra, on which the urine—although in a healthy condition—acts as an irritant.

CHAPTER VIII.

DEOBSTRUENTS,* ALTERATIVES† AND ANTIDOTES.‡

Deobstruents—Are indirect agents. Alteratives—Their *modus operandi*—Only used in chronic diseases. Antidotes—Definition of—Are of two kinds—Division of poisonous agents—Therapeutics of poisoning, internal and external—Table of poisons and their antidotes.

WHEN the humoral pathology was universally in vogue, the deobstruent medication was every where invoked. It was believed, that, owing to altered consistence of the blood and humors, the small vessels might become obstructed; and that certain agents, by modifying the spissitude of the circulating fluid, might remove such obstruction, and therefore be entitled to the appellation of ‘deobstruents.’ It is clear, however, that all such remedies must be relative agents only. Obstructions in the capillary system of vessels must depend upon so many causes, that no exclusive plan of medication can be appropriate; and, accordingly, at the present day, the term ‘deobstruent’ is almost banished from medical language; and, when we meet with it, it is too often employed without any precise ideas being attached to it.

Formerly, it corresponded with the term ‘*aperient*,’ in its *general*—not in its *restricted*—acceptation. Now, it is more commonly used conventionally—to express the agent, whatever may be its nature, which renders parts pervious that may have been obstructed. To exhibit the indefinite manner in which it is employed by those, who yet retain it, it is sufficient to refer to one of our most recent and most valuable works on the materia

* DephRACTICA, deoppilantia, deoppilativa, from *de*, and *obstruere*, ‘to obstruct.’

† Alterantia, alloiotica, alloeotica, from *alterare*, ‘to change.’

‡ Alexicaca, alexipharmaca, alexiteria, theriaca, counterpoisons; from *avti*, ‘against,’ and *δίδωμι*, ‘I give.’

medica ;* in which we are told, that the sulphate of potassa “is *deobstruent*, and cathartic ;” and the carbonate of soda “antacid and *deobstruent* :” From what we know of the effect of alkalies, in augmenting the tenuity of the blood, we might understand,—if that fluid were too viscid, and if obstructions were caused by such viscosity—that a *deobstruent* effect might be exerted by the carbonate of soda ; but even if we were to admit the possibility of such stasis of the fluid of the circulation in the capillary system of vessels, we have no means of detecting it, and we could not consequently pronounce when the remedy is indicated. It is well known, however, that obstructions are generally—if not always—induced by excited action of the capillaries, which gives occasion to new depositions,—to morbid formations, in other words—over which the agents in question have but little control.

But if we admit the *deobstruent* agency of the carbonate of soda, it is not so easy for us to understand how the sulphate of soda can accomplish a similar result, or why this salt should be considered entitled to the merit of being a *deobstruent* any more than the whole class of saline agents ; and I suspect it would not be an easy matter for the respectable author, who has ascribed such action to the sulphate of potassa, to explain distinctly what he meant, by the term ‘*deobstruent*,’ as contradistinguished from ‘*cathartic*,’ in the case in question.

Although the idea of any specific *deobstruent* operation is now wisely denied to our medicinal agents, no doubt can exist in the mind of any one, that there are substances, which, when taken into the system, in small doses, may act upon morbid structures so as to occasion their removal, without any immediate sensible evacuation or operation. It is to such remedies, that we apply the term ‘*alteratives*.’ It need hardly be said, that in admitting such a class of therapeutical agents, the greatest caution is necessary, lest we should assign to the insensible influence of the remedy what ought to be ascribed to the recuperative power, which the system and every part of it possesses, and to which I have had occasion to allude—more than once—in the course of these pages.

* ‘The Dispensatory of the United States of America.’ By Geo. B. Wood, M. D., &c., &c., and Franklin Bache, M. D.

In the extensive signification, given to the term above, excitants, tonics, &c., are alteratives ; but the acceptation is ordinarily restricted to powerful medical agents, when administered in such small doses as not to produce any immediately apparent effect : accordingly mercury, in very small doses, and iodine—given so as to occasion the absorption of hypertrophied parts—must be looked upon as alteratives. The Homœopathic practice of medicine, when the remedy exerts any influence, is altogether alterative ; but generally—as we have seen—that system is wholly indebted for its efficacy, to the circumstance, that whilst the infinitesimal and inert doses of potent agents,—and the remark obviously applies *à fortiori* to those agents that are not possessed of any remedial operation in any dose,—the system is abandoned to its own efforts of recuperation, which, if not improperly and officiously interfered with, are adequate to the repair of many internal as well as external injuries, that, under other modes of management, become, at times, so formidable.

There are but two ways, perhaps, in which alteratives can exert their agency on the system ;—the one is through the new impression they make directly on the nerves ;—the other, through the way of absorption. Tonics, it is probable, act in the former manner ; Sorbefacients, which occasion the absorption of the solid parts of the body,—all substances, indeed, which impress new activity on the capillary action,—in the latter.

If corrosive sublimate or arsenic be given in small doses, oft repeated, in obstinate cutaneous affections, we occasionally discover, that the eruption fades gradually away, and that, after a time, the parts are restored to health. The same thing happens, if we administer saccharine solutions in the manner I have before described. All this occurs without any manifest evacuation, and is, therefore, referable to ‘alterative’ agency. The mode, in which this is probably exerted, is by the changes produced in the circulating fluid by the salts in question, and by the sugar ;—for we have already seen, that they produce manifest changes on venous blood out of the body. The altered fluid enters the intermediate circulation ; changes the character of the nutrition, accomplished there, by the new impression made on the nerves distributed to the capillary vessels, and in this way a new action is assumed by them, which breaks in upon the old ; the vital affinities are modified ; and harmony succeeds to the irregularity of action previously existing. It is in this way, that we explain the efficacy of mineral waters, and of many other agents, which have had the reputation of ‘purify-

ing the blood ;' and which doubtless impress changes on that fluid. We know, from direct experiment, that the presence of saline matter in the blood is essential to its due constitution ; and conversion in the lungs ;* and we can readily conceive, that the saline substances, contained, in a dilute state, in mineral waters, may pass into the venous system by imbibition, and so change the constitution of the fluid of the circulation, that when it attains the intermediate circulatory system—in which all nutrition is effected—the modified pabulum may so impress the organs that preside over nutritive exhalation, that new vigor may be communicated to the function, and old morbid cachexies or dyscrasies—as they are more frequently termed by the German writers—may disappear. “Though great allowance,” says Mr. E. A. Jennings,† “must be made for the effects of change of air, relaxation from business, change of habits, and other accidental circumstances, yet all candid observers must acknowledge, that when due allowance has been made for all these circumstances, a large residuum of cases remains where the most surprising good effects have been produced by a course of mineral waters. From the effects generally produced by them on the kidneys, it is evident, that a large portion of the water is absorbed, and it is probable that their good effect is to be attributed as much to the alteration they produce in the chemical character of the blood, by entering into its composition, as to the increase they occasion of the secretions of the bowels. My own observations and analyses would favour this opinion, but they are, at present, too few to enable me to express any decided opinion upon the subject.”

At one time, it was a common belief, that the condition of the blood could be extensively modified by the infusion of various substances into it ; but the plan is rarely adopted at the present day. It was even advised formerly, that blood should be taken from another individual, and transfused into the bloodvessels to ‘alter’ the objectionable qualities of the circulating fluid ; but, at this time, ‘transfusion’ of blood is only employed when the bloodvessels have been drained—by uterine hemorrhage, for example. Fresh excitation has thus been communicated to the organs, and the patient has appeared to rally, in some instances, where hope had been almost abandoned.

It is obviously only in diseases of a chronic character, that

* ‘Human Physiology,’ 2d edit. ii. 111.

† ‘Transactions of the Provincial Medical and Surgical Association, of England,’ vol. 3.

alteratives can be invoked. One of the elements of their operation is time. None of them can act immediately, if we except the alterative influence of change of air, society and scenery, the effect of which on morbid conditions kept up by habit, as it were, is often as rapid as it is striking. The reflecting practitioner will readily see, that in adopting any plan of alterative management he must be guided by those great principles, which have been canvassed in the preceding chapters and sections; and especially in the one devoted to the consideration of revellents. Some of the revellents, which we employ in protracted disease, are altogether alterative. Of this nature are the preparations of mercury,—administered to break in upon the morbid catenation in febrile and inflammatory disorders, which have run on for an unusual length of time. Any treatment, in short, which does not excite a marked effect upon any function at the time of its exhibition, or soon afterwards, but is followed by, and occasions, a gradual improvement in existing diseased actions, must be esteemed alterative. I need hardly repeat, however, that great caution is necessary in such cases in tracing effects to their causes, and that we may often err in referring that to the agent, which is more properly ascribable to the recuperative energies of the system.

The days of secret poisoning have now passed away; and, with them, the use of alexipharmics, alexiterics and theriacs, which encumbered the works on materia medica and pharmacy; and although it cannot be denied, that a Toffania, and a Brinvillier might prepare arsenical and other combinations of such a degree of strength, that, when regularly exhibited, they might ultimately exert a deleterious agency on the system, such cases must be looked upon as extremely rare, if they ever occur.‡

The term ‘antidote’ is now employed in the sense of ‘counter-poison.’ It means an agent, which has the power of destroying—more or less—the deleterious properties of poisonous substances, in the stomach or out of it. Dr. Christison divides them into two kinds;—the one taking away the deleterious qualities of the poison before it comes within the sphere of action, by altering its chemical nature;—the other, controlling the poisonous action after it has begun, by exciting a contrary action in the system.* The former are decidedly the most important

* ‘A Treatise on Poisons,’ 2d edit. p. 31; and the ‘Manual of Practical Toxicology’ of my scientific friend and colleague, Professor Ducatel, p. 33.

in a therapeutical point of view. A reference to the table at the end of this chapter will shew, that there are very few agents, which we can rank under the latter.

Perhaps, all poisonous articles may admit of classification under the three heads—of *irritants*, *narcotics* and *narcotico-acrids*. This is the division, that has been employed by Dr. Christison—in the ‘treatise’ cited—and by Dr. Beck, in the second edition of his valuable work on Medical Jurisprudence. These terms convey to the mind the symptoms, that may be expected from the individual agents belonging to the respective divisions, as well as their *modus operandi*. The *first*,—‘irritants’—under which may be ranged, the vegetable ‘acrids,’ of the classifications of Fodéré and Orfila, as well as the ‘corrosives’ of the same toxicologists—inflame the lining membrane of the digestive tube, and destroy by the violent action they excite in that expansion. Some of the class, however, act also on organs more remote; but still—as Dr. Christison has observed—the most prominent feature is the inflammation they excite wherever they are applied. The *second*—‘narcotics’—act but insignificantly on the part to which they are applied. Their influence is exerted on the great nervous centres,—either through the impression they make on the nerves of the part,—on the nerves distributed to the lining membrane of the bloodvessels of the part, or through the agency of the circulation;—all which has been investigated under the section on narcotics;—and *lastly*, the ‘narcotico-acrids’ or ‘acro-narcotics’ combine the agencies of the other two divisions. They are acrid and narcotic;—that is, they not only affect the great nervous centres injuriously—causing narcosis,—but they irritate and inflame the lining membrane of the first passages. Some of the most deadly poisons belong to this division of toxical agents.

It fortunately happens, that, therapeutically, the same mode of management is applicable, whatever may be the poisonous agent taken. The great object is to remove the poison as soon as possible,—by the stomach pump, if it be at hand, and, if not, by mechanical irritants applied to the fauces or by one of the direct emetics; and here we have to bear in mind the remark, made under the head of ‘diluent,’ that if the poisonous agent be soluble, dry vomiting should be induced; for if a large quantity of fluid be allowed, and it be not removed from the stomach on the instant, the deleterious effects of the poison may be exerted with more energy than if fluid had been denied. Where the stomach-

pump is at hand, the stomach can be well washed out, without the fluid remaining long enough to admit of the solution of the poison, and its subsequent absorption.

The removal of the poison is the object, then, of primary moment ; but, along with this, or subsequently, those agents may be employed, which are known to modify the chemical condition of the poison, by rendering it insoluble or nearly so,—not only in water, but in the gastric secretions. Such are ‘true antidotes,’ and alone to be trusted to. “It is chiefly,” says Dr. Christison, “among the changes induced by chemical affinities, that the practitioner must look for counterpoisons ; and the ingenuity of the toxicologist has thence supplied the *Materia Medica* with many of singular efficacy. When given in time, magnesia or chalk is a complete antidote for the mineral acids, and oxalic acid ; albumen for corrosive sublimate and verdigris ; bark for tartar emetic ; common salt for lunar caustic ; sulphate of soda or magnesia for sugar of lead and muriate of baryta ; chloride of lime or soda for liver of sulphur ; vinegar or oil for the fixed alkalis, and these substances act either by neutralizing the corrosive power of the poison, or by forming with it an insoluble compound.”*

It need scarcely be said, that any therapeutical agents, which add to the activity of absorption, must be improper whilst a soluble poison is in the stomach, or is applied to any solution of continuity on the surface of the body. Bloodletting, being one of the most energetic sorbefacients, ought to be carefully avoided, except where the poison is a purely local corrosive. In cases of external poisoning, a cupping-glass is applied to the wound, or a ligature is put round the limb, above the seat of injury,—on similar principles. The cupping-glass not only prevents absorption, but draws the blood from the wound, and with it the poison ; whilst it compresses the nerves surrounding the wounded part, and may thus,—in accordance with the views of Messrs. Addison and Morgan,—prevent the impression made by the poison on the sentient extremities of the nerves from being transmitted along them.

Lastly:—The practitioner may have to attend to the effects of the poison upon the functions, and to remove morbid phenomena that may have been induced by it. These have to be treated on general principles. In the state of exhaustion, occasioned

* *Op. citat.* p. 33.

by the hydrocyanic acid, diffusive stimulants are given : in the narcosis, induced by opium, the cold douche may be needed ; and, where inflammatory symptoms appear, after the poison has been removed from the stomach, bloodletting and the whole class of antiphlogistics may be imperiously demanded.

T A B L E

OF POISONS AND THEIR ANTIDOTES.*

CLASS FIRST.—INORGANIC POISONS.

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Acids. 2. Alkalies and their compounds. 5. Bromine. 4. Earths and their compounds. 5. Empyreumatic Oils. 6. Ethers. | <ol style="list-style-type: none"> 7. Gases. 8. Glass or Enamel, pounded. 9. Iodine. 10. Metals and their compounds. 11. Phosphorus. 12. Vapours. |
|---|---|

CLASS SECOND.—ORGANIC POISONS.

A. VEGETABLE.

1. Acro-Narcotics.
2. Irritants.
3. Narcotics.
4. Proximate Principles of Vegetables.

B. ANIMAL.

1. By change in constitution, or disease.
2. Fishes.
3. Insects.
4. Serpents.

N. B. Irritant poisons are marked thus.† Indigenous plants, *. Exotic plants introduced into this country.†

ANT. Where this abbreviation does not follow any article, it means, that there is no established antidote for it.

CLASS I.—INORGANIC POISONS.

I. Acids.

- † Acidum Aceticum. *Acetic Acid*.
 ANTIDOTE.—Magnesia. Carbonate of Magnesia.
 † Acidum Arsenicum. *Arsenic Acid*.
 ANT. Hydrated Trit-oxide of Iron?
 † Acidum Arseniosum. *Arsenious Acid*.
 ANT. Hydrated Trit-oxide of Iron?
 † Acidum Botulinicum. *Botulinic Acid*.
 See *Sausage Poison*.
 Acidum Carbonicum. *Carbonic Acid*. See *Gases*.
 † Acidum Citricum. *Citric Acid*.
 ANT. Carbonate of Potash. Carbonate of Lime.
 † Acidum Hydrochloricum. *Hydrochloric Acid*.
 ANT. Carbonate of Soda.

- Acidum Hydrocyanicum. *Hydrocyanic Acid*.
 ANT. Ammonia. Chlorine, (liquid.)
 † Acidum Muriaticum. *Muriatic Acid*.
 ANT. See Acidum Hydrochloricum.
 † Acidum Nitricum. *Nitric Acid*.
 ANT. Carbonate of Lime Magnesia Carbonate Magnesia.
 † Acidum Phosphoricum. *Phosphoric Acid*.
 ANT. Carbonate of Lime.
 Acidum Prussicum. *Prussic Acid*.
 ANT.—See Acidum Hydrocyanicum.
 † Acidum Sulphuricum. *Sulphuric Acid*.
 ANT. Magnesia—Carb. of Magnesia—Carb. of Lime.
 Acidum Sulphurosum. *Sulphurous Acid*. See *Gases*.
 † Acidum Tartaricum. *Tartaric Acid*.
 ANT.—Carbonate of Lime—Carbonate of Potash.

* This table was formed, at my request, by my friend, Mr. Wm. R. Fisher, of this city, Baltimore, —a gentleman, whose scientific attainments are ample, and whose attention has been zealously and usefully directed to the chemical and other relations of Toxicology, some of the results of which are contained in the pages of the 'American Journal of Pharmacy.'

II. Alkalies and their Compounds.

- † Ammonia Liquor. *Water of Ammonia.*
 ANT.—Fixed Oils—Vinegar—Lemon Juice.
 † Ammonia Arsenias. *Arseniate of Ammonia.*
 ANT.—See Arsenic.
 † Ammonia Arsenis. *Arsenite of Ammonia.*
 ANT.—See Arsenic.
 † Ammonia Murias. *Muriate of Ammonia.*
 † Potassa. *Caustic Potash.*
 ANT.—Fixed Oils. Vinegar. Lemon Juice.
 † Potassa Arsenias. *Arseniate of Potash.*
 ANT. See Arsenic.
 † Potassa Arsenis. *Arsenite of Potash.*
 ANT. See Arsenic.
 † Potassa Bichromas. *Bichromate of Potash.*
 ANT. Carbonate of Potash. Carbonate of Soda.
 † Potassa Carbonas. *Carbonate of Potash.*
 ANT. Lemon Juice. Vinegar.
 † Potassa Hydrobromas. *Hydrobromate of Potash.*
 † Potassa Hydriodas. *Hydriodate of Potash.*
 † Potassa Nitras. *Nitrate of Potash.*
 † Potassa Sulphuretum. *Sulphuret of Potash.*
 ANT. Muriate of Soda. Chloride of Soda.
 † Soda. *Caustic Soda.*
 ANT. Fixed Oils. Vinegar. Lemon Juice.

III. Brominum.

- Bromine.*
 † Hydrobromas Potassa. *Hydrobromate of Potash.*

IV. Earths and their Compounds.

- † Baryta. *Barytes.*
 ANT. Dilute Sulphuric Acid.
 † Baryta Carbonas. *Carbonate of Barytes.*
 ANT. Dilute Sulphuric Acid.
 † Baryta Murias. *Muriate of Barytes.*
 ANT. Sulphate of Magnesia. Sulphate of Soda.
 Barytas Nitras. *Nitrate of Barytes.*
 ANT. Sulphate of Magnesia. Sulphate of Soda.
 † Calx. *Quicklime.*
 ANT. Mineral or Soda Water (artificial)? Effervescing draught?

V. Empyreumatic Oils.

- Creosote.
 ANT. Albumen?
 Oleum Adipis Empyreumaticum. *Empyreumatic Oil, from Lard.*
 Oleum Cornu Cervi Empyreumaticum. *Oil of Hartshorn—Dippel's Animal Oil.*
 ANT. Fixed Oils. Vinegar. Lemon Juice.
 Oleum Picis Liquidæ. *Oil of Tar.*
 Oleum Tabaci Empyreumaticum. *Empyreumatic Oil of Tobacco.*
 Oleum Terebinthinæ. *Oil of Turpentine.*

VI. Ethers.

- Æther Nitricum. *Nitric Ether.*
 Æther Sulphuricum. *Sulphuric Ether.*

VII. Gases.

- † Ammoniacal.
 † Arseniuretted Hydrogen.
 Carbonic Acid.
 Carburetted Hydrogen.

- † Chlorine.
 ANT. Inhalation of Ammonia or Ether.
 † Muriatic Acid.
 ANT. Inhalation of Ammonia cautiously.
 † Nitric Oxide.
 † Nitrous Acid.
 ANT. Inhalation of Ammonia cautiously.
 † Oxygen.
 Sulphuretted Hydrogen.
 ANT. Inhalation of Chlorine cautiously.
 † Sulphurous Acid.
 ANT. Inhalation of Ammonia cautiously.

† VIII. Glass or Enamel pounded.

† IX. Iodinum.

- Iodine.*
 ANT. Gluten. Wheat Flour. Starch.
 † Hydriodas Potassa. *Hydriodate of Potash.*

X. Metals, and their Compounds.

- Antimonium. *Antimony.*
 † Antimonii Murias. *Muriate of Antimony.*
 ANT. Astringent Infusions.
 † Antimonii Oxidum. *Oxide of Antimony.*
 ANT. Astringent Infusions.
 † Antimonii et Potassa Tartras. *Tartrate of Antimony and Potash.*
 ANT. Astringent Infusions and Decoctions.
 † Antimonii Vitrum. *Glass of Antimony.*
 Argentum. *Silver.*
 † Argenti Nitras. *Nitrate of Silver.*
 ANT. Muriate of Soda.
 † Arsenicum. *Arsenic.**
 † Arsenias Ammonia. *Arseniate of Ammonia.*
 ANT. Hydrated Trit-oxide of Iron?
 † Arsenias Potassa. *Arseniate of Potash.*
 ANT. Hydrated Trit-oxide of Iron?
 † Arsenias Soda. *Arseniate of Soda.*
 ANT. Hydrated Trit-oxide of Iron?
 † Arsenis Ammonia. *Arsenite of Ammonia.*
 ANT. Hydrated Trit-oxide of Iron?
 † Arsenis Cupri. *Arsenite of Copper.*
 ANT. Hydrated Trit-oxide of Iron?
 † Arsenis Potassa. *Arsenite of Potash.*
 ANT. Hydrated Trit-oxide of Iron?
 † Arsenici Oxidum Album. *White Oxide of Arsenic.*
 ANT. Hydrated Trit-oxide of Iron?
 † Arsenici Oxidum Nigrum. *Black Oxide of Arsenic.*
 ANT. Hydrated Trit-oxide of Iron?
 † Arsenici Sulphuretum Flavum. *Yellow Sulphuret of Arsenic.*
 † Arsenici Sulphuretum Rubrum. *Red Sulphuret of Arsenic.*
 Anrum. *Gold.*
 † Auri Nitro-Murias. *Nitro-Muriate of Gold.*
 ANT. Sulphate of Iron.
 Bismuthum. *Bismuth.*
 † Bismuthi Nitras. *Nitrate of Bismuth.*
 ANT. Milk—Mucilaginous Drinks.
 Chromium. *Chrome.*
 † Bichromas Potassa. *Bichromate of Potash.*

* The oxide of iron, recommended as an antidote to the preparations of arsenic, is the hydrated tritoxide, prepared by treating sulphate of iron with nitric acid and precipitating by ammonia. It must be used freshly prepared.—F.

ANT. Carbonate of Potash—Carbonate of Soda.
 Cuprum. *Copper.*
 † Cupri Acetas. *Acetate of Copper.*
 ANT. Albumen—Sugar—Iron.
 † Cupri Arsenis. *Arsenite of Copper.*
 ANT. Hydrated Trit-oxide of Iron.
 † Cupri Carbonas. *Carbonate of Copper.*
 ANT. Albumen—Iron.
 † Cupri Oxidum. *Oxide of Copper.*
 ANT. Albumen—Iron.
 † Cupri Sulphas. *Sulphate of Copper.*
 ANT. Albumen—Iron.
 Ferrum. *Iron.*
 † Ferri Murias. *Muriate of Iron.*
 ANT. Carbonate of Soda.
 † Ferri Sulphas. *Sulphate of Iron.*
 ANT. Carbonate of Soda.
 Hydrargyrum. *Mercury.*
 † Hydrargyri Chloridum Corrosivum. *Corrosive Chloride of Mercury.*
 ANT. Albumen—Gluten.
 † Hydrargyri Cyanuretum. *Cyanuret of Mercury.*
 † Hydrargyri Nitras. *Nitrate of Mercury.*
 † Hydrargyri Oxidum Rubrum. *Red Oxide of Mercury.*
 † Hydrargyri Sulphas Flavus. *Yellow Sulphate of Mercury.*
 † Hydrargyrum Ammoniatum. *Ammoniated Mercury.*
 Osmium. *Osmium.*
 † Osmii Murias. *Muriate of Osmium.*
 Palladium. *Palladium.*
 † Palladii Murias. *Muriate of Palladium.*
 Platium. *Platina.*
 † Platini Murias. *Muriate of Platina.*
 ANT. Muriate of Ammonia?
 Plumbum. *Lead.*
 † Plumbi Acetas. *Acetate of Lead.*
 ANT. Sulphate of Magnesia—Sulphate of Soda—Phosphate of Soda.
 † Plumbi Carbonas. *Carbonate of Lead.*
 ANT. Dilute Sulphuric Acid?
 † Plumbi Oxidum Rubrum. *Red Oxide of Lead.*
 † Plumbi Oxidum Semivitreum. *Semivitrified Oxide of Lead.*
 Stannum. *Tin.*
 † Stanni Murias. *Muriate of Tin.*
 ANT. Milk.
 Zincum. *Zinc.*
 † Zinci Oxidum. *Oxide of Zinc.*
 † Zinci Sulphas. *Sulphate of Zinc.*
 ANT. Sulphate of Magnesia—Sulphate of Soda.

† XI. Phosphorus.

ANT. Copious draughts containing Magnesia.

XII. Vapours.

† Antimonial.
 † Arsenical.
 † Bromine.
 † Iodine.
 Leaden.
 Mercurial.

CLASS II.—ORGANIC POISONS.

A. VEGETABLE.

I. Acro-Narcotics.

* *Æthusa Cynapium.* *Common Fool's Parsley.*
 ANT. Bromine. Chlorine. Iodine.
 * *Aconitum Napellus.* *Monkshood.*
 ANTIDOTE. Bromine—Chlorine—Iodine.*
 * *Agaricus*, 5 species. *Mushrooms (poisonous).*
Amanita Muscaria. *Truffles (poisonous).*
 * *Anagallis Arvensis.* *Meadow Pimpernell.*
Anda Gomesii.
 * *Apocynum Androsæmifolium.* *Dogsbane.*
 * *Aristolochia Clematidis.* *Birlwort.*
Arnica Montana. *Leopard's bane.*
 * *Asclepias Syriaca.* *Swallowwort.*
 † *Atropa Belladonna.* *Deadly Night Shade*
 ANT. Bromine—Chlorine—Iodine.
 * *Æsculus Ohioensis.* *Buckeye.*
Brucea Antidysenterica. *False Augustara Bark.*
 ANT. Bromine—Iodine.
Cerbera, 3 species. *Cerbera.*
 ANT. Bromine—Chlorine—Iodine.
Chærophyllum Silvestre. *Bastard Hemlock.*
Chaillotia Toxicana. *Ratbane.*
 * *Chenopodium Murale.* *Wormseed.*
 * *Cicuta Maculata.* *American Hemlock.*
 † *Cicuta Virosa.* *Water Hemlock.*
Cissus.
Cocculus Indicus. *Fish berries.*
 ANT. Bromine—Chlorine—Iodine.
Colchicum Autumnale. *Meadow Saffron.*
 ANT. Bromine—Chlorine—Iodine.
 * *Conium Maculatum.* *Hemlock.*
 ANT. Bromine—Chlorine—Iodine.
Coriaria Myrtifolia. *Myrtle leaved Sumach.*
Curare. *Indian War Poison.*
 ANT. Common Salt—Sugar.
Cynanchum Erectum. *Cynanchum.*
Cytisus Laburnum. *Laburnum.*
 ANT. Bromine—Chlorine—Iodine.
 * *Datura Stramonium.* *Thorn apple.*
 ANT. Bromine—Chlorine—Iodine.
 † *Digitalis Purpurea.* *Foxglove.*
 ANT. Infusion of Yellow Bark.
Ergot. See *Secale.*
 * *Ervum Ervilia.* *Bitter Vetch.*
 * *Gaultheria Procumbens.*
Wintergreen (oil of.)
Hæmanthus Toxicarius.
Helleborus Niger. *Black Hellebore.*
Hypophyllum Sanguinaria. *Puddock Stool.*
Ipecacuanha. *Ipecacuanha.*
 ANT. Bromine. Chlorine. Iodine.
Lathyrus Cicera. *Lathyrus.*
Laurus Camphora. *Camphor.*
 * *Lobelia Inflata.* *Indian Tobacco.*
 * *Lolium Temulentum.* *Darnel.*
 * *Melia Azederach.* *Pride of China.*
Mercurialis Perennis. *Mountain Mercury.*
Nerum Oleander. *Common Oleander.*

* Bromine, Chlorine, and Iodine, are said to be antidotes to the alkaloids generally, and they are therefore affixed to all those plants which are known to contain such a principle. F.

- * *Enanthe Crocata*. *Hemlock Dropwort*.
 ANT. Infusion of Galls.
 * *Nicotiana Tabacum*. *Tobacco*.
 * *Passiflora Quadrangularis*. *Barbadine*.
Piscidia Erythema. *Jamaica Dogwood*.
Polygala Venenosa (of Java.)
 * *Rhus Radicans*. *Poison Vine*.
 † *Rhus Toxicodendron*, *Poison Oak* or *Su-mach*.
 * *Robinia Pseudo-acacia*. *Locust Tree*.
 * *Ruta Graveolens*. *Rue*.
 * *Sanguinaria Canadensis*. *Blood Root*.
Scilla Maritima. *Squill*. *Sea Onion*.
 ANT. Bromine. Chlorine. Iodine.
 † *Secale Cornutum*. *Ergot*. *Spurred Rye*.
 * *Sium Latifolium*. *Procumbent Water Parsnip*.
 * *Spigelia Marilandica*. *Pink Root*.
Strychnos Ignatii. *St. Ignatius's Bean*.
 ANT. Bromine. Chlorine. Iodine.
Strychnos Nux Vomica. *Nux Vomica*.
 ANT. Bromine. Chlorine. Iodine.
 * *Symplocarpus Fœtida*. *Skunk Cabbage*.
Ticunas. *Extract of Various Plants.—S. America*.
Tieute. *Upas tieute*. *Tree of Java*.
 † *Triticum Hybernum*. *Wheat (diseased)*.
Upas Antiar. *Tree in Java*.
Veratrum Album. *White Hellebore*.
 ANT. Bromine. Chlorine. Iodine.
 * *Veratrum Viride*. *American Hellebore*.
 ANT. Bromine. Chlorine. Iodine.
Woorara. *War Poison of Guiana*.
 * *Zea Mays*. *Maize, (diseased)*.

II. Irritants.

- * *Anemone Pulsatilla*. *Wind Flower*.
 * *Arum Maculatum*. *Wake Robin*.
Brionia Dioica. *Bryony*.
 ANT. Bromine. Chlorine. Iodine.
 * *Caladium Seguinum*. *Dumbcane*.
 * *Calla Palustris*. *Water Arum*.
 * *Caltha Palustris*. *Marsh Marigold*.
 † *Chelidonium Majus*. *Celandine*.
 † *Clematis Vitalba*. *Virgin Bower*.
Convolvulus Jalapa. *Jalap*.
 ANT. Bromine. Chlorine. Iodine.
Convolvulus Scammonia. *Scammony*.
Croton Tiglium. *Purging Croton*.
 † *Cucumis Colocynthis*. *Colocynth*.
 ANT. Bromine. Chlorine. Iodine.
Cyclamen Europæum. *Sow Bread*.
Daphne Gnidium. *Spurge Flax*.
Daphne Mezereum. *Mezereon*.
 † *Delphinium Staphysagria*. *Stavesacre*.
 ANT. Bromine. Chlorine. Iodine.
Doica Palustris. *Swamp leather wood*.
 * *Equisetum Hyemale*. *Scourgrass*.
Euphorbia Officinaria. *Euphorbium*. *Spurge*.
 ANT. Bromine. Chlorine. Iodine.
 * *Gratiola Officinalis*. *Hedge Hyssop*.
Hippomane Mancinella. *Manchineel*.
Hura Crepitans. *Sand Box*.
 * *Hydrocotyle Vulgaris*. *Marsh Pennywort*.
Jatropha Curcas. *Indian Nut*.
Jatropha Manihot. *Cassada*.
 * *Juniperus Sabina*. *Savin*. (oil of)
 * *Juniperus Virginiana*. *Red Cedar*. (oil of)
Momordica Elaterium. *Squirting Cucum-ber*.
 ANT. Bromine. Chlorine. Iodine.
 † *Narcissus Pseudo—Narcissus*. *Daffodil*.
Pastinax Sativa. *Common Parsnip*.
 * *Pedicularis Palustris*. *Marsh Lousewort*.

- * *Phytolacca Decandra*. *Poke*.
Piper Cubeba. *Cubeb*.
Plumbago Europæa. *Toothwort*.
 ANT. Bromine. Chlorine. Iodine.
 * *Ranunculus Acris*, and other species.
Crowfoot.
Rhododendron Chrysanthemum. *Oleander*.
 † *Ricinus Communis*. *Castor Oil Plant*.
Sambucus Ebulus. *Elder*.
 † *Sedum Acre*. *Stone Crop*.
Stalagmitis Cambogioides. *Gamboge*.
 † *Tanacetum Vulgare*. *Tansy*. [oil of]

III. Narcotics.

- * *Actæa Spicata*. *Baneberry*.
Amygdalus Communis. *Bitter Almond*.
 † *Amygdalus Persica*. *Peach*.
Gelsemium Nitidum. *Yellow Jessamine*.
Helonia Erythrosperma. *Fly Poison*.
Hyoscyamus Albus. *White Henbane*.
 ANT. Bromine. Chlorine. Iodine.
 * *Hyoscyamus Niger*. *Black Henbane*.
 ANT. Bromine. Chlorine. Iodine.
 * *Kalmia Latifolia*. *Mountain Ivy*.
Lactuca Virosa. *Strong Scented Lettuce*.
 Opium and proximate principles.
 ANT. Infusion of Galls.
 † *Papaver Somniferum*. *Poppy*. See Opium.
Paris Quadrifolia. *Herb Paris*.
 * *Prunus Caroliniana*. *Wild Orange*.
 † *Prunus Lauro—Cerasus*. *Cherry Laurel*.
Prunus Nigra. *Black Cherry*.
 † *Prunus Padus*. *Cluster Cherry*.
 † *Prunus Virginiana*. *Wild Cherry*.
 * *Solanum Dulcamara*. *Bitter Sweet*.
 ANT. Bromine. Chlorine. Iodine.
 * *Sorbus Acuparia*. *Mountain Ash*.
 * *Taxus Baccata*. *Yew*.

IV. Proximate Principles of Vegetables.

- Aconitine, see Aconitum.
 Atropine, see Atropa.
 Brucine, see Brucea.
 Codeine, see Opium.
 Colocynthine, see Cucumis.
 Daturine, see Datura.
 Delphine, see Delphinium.
 Elatine, see Momordica.
 Emetine, see Ipecacuanha.
 Hyoscyamine, see Hyoscyamus.
 Morphine and Salts, see Opium.
 Narcotine, see Opium.
 Picrotoxine, see Cocculus.
 Strychnine, see strychnos.
 Veratrine, see Colchicum.

B. ANIMAL.

I. By change in Constitution or Disease.

- † Bacon.
 † Cheese.
 Crabs.
 † Eels.
 † Glanders, (infection from horses labouring under).
 Mackerel.
 Milk.
 † Oily Matter from Kipper or dried Salmon
 † Oysters.

† Pustule Maligne [flesh of animals labouring under.]

Putrid Blood, Bile, or Brain.

Saliva of the Rabid Dog.

† Sausage Poison [bloody and white.]

II. Fishes.

† Balistes Monoceros. *Old Wife*.

† Cancer Astacus. *Crawfish*.

† Cancer Ruricolus. *Land Crab*.

† Clupea Thryssa. *Yellow billed Sprat*.

† Coracinus fuscus Major. *Gray Snapper*.

† Coracinus Minor. *Hyne*.

† Coryphæna Splendens. *Dolphin*.

† Mormyra. *Blue Parrot fish*.

† Muræna Major. *Conger Eel*.

† Mytilus Edulis. *Mussel*.

† Ostracion Globellum. *Smooth Bottlefish*.

† Perca Major. *Barracuda*.

† Perca Venenata. *Rockfish*.

† Perca Venenosa. *Grooper*.

† Physalia. *Portuguese Man of war*.

† Scomber Cæruleus. *Spanish Mackerel*.

† Scomber Maximus. *Kingfish*.

† Scomber Thynnus. *Bonetta*.

† Sparus Chrysops. *Porgée*.

† Tetrodon Ocellatus. *Blower*.

† Tetrodon Sceleratus. *Tunny*.

III. Insects.

† Apis Mellifica. *Bee*.

ANT. Water of Ammonia.

† Cantharis Vesicatoria. *Spanish Fly*.

† Culex Pipiens. *Gnat*.

† Lytta Vittata. *Potatoe Fly*.

† Oestrus Bovis. *Gad Fly*.

† Scorpio. *Scorpion*.

† Tarantula. *Tarantula*.

Vespa Crabro. *Hornet*.

ANT. Water of Ammonia.

† Vespa Vulgaris. *Wasp*.

ANT Water of Ammonia.

IV. Serpents.

† Boa Crotaloides. *Copperhead*.

† Cenchus Mockeson. *Mockeson*.

† Coluber Berus. *Viper*.

† Crotalus, (5 species.) *Rattle Snake*.

† Scytale Piscivorus. *Water Viper*.

CHAPTER IX.

CONCLUDING OBSERVATIONS.

Combination of therapeutical agents—Importance of a due attention to principles—Value of authority—Professional qualifications may be estimated by the prescription—Evils of complexity in prescribing—Conclusion.

I HAVE now considered the main admitted classes of therapeutical agents, or of those which ought perhaps to be admitted. It is rarely, however, that the practitioner draws his resources, in the management of disease, from one class only. Not always, indeed, does he restrict himself to the agencies furnished by either of the two great divisions of vital agents—excitants and sedatives. Even in the treatment of febrile and inflammatory diseases—for which the classes of the latter division are so admirably adapted—the Therapeutist not unfrequently has recourse to some of the classes of excitants. Thus—we have seen—he invokes the use of emetics, cathartics, diaphoretics, and revellents; and often—when appropriately invoked—with marked advantage; but, under other circumstances, with decidedly evil consequences. Yet, it is obvious, that they cannot be esteemed direct or true antiphlogistics. The actual immediate operation of these evacuants—as a recent therapeutical writer* has remarked—is the opposite of that produced by sedatives or true antiphlogistics: their antiphlogistic effect is only secondary. “They first excite the tissue on which they act, as a consequence of which secretion ensues. But if this does not occur, as often happens, a phlogosis or inflammation then results, or is aggravated, if previously existing, from the intensity of their unrelieved irritation.”

* Professor Jackson, in art. ‘Antiphlogistics,’ in ‘Hays’s ‘American Cyclopedia of Practical Medicine.’

This is, doubtless, one of the modes in which these 'local stimulants' prove injurious; but even if they excite the secretion of the lining membrane of the intestinal canal, and produce evacuation after evacuation—as is too often done in febrile diseases—the perturbation, which they induce in the economy, is attended with results any thing but antiphlogistic; and, accordingly, cathartics are now generally employed in the ordinary fevers of our country, chiefly with the view of keeping the intestinal canal free from morbid secretions and accumulations,—not so much as depletives;—whilst the trust of the practitioner—as I have said more than once—is reposed rather in the proper use of sedatives—bloodletting, general, or local, or both, as the case may require; refrigerants, nauseants and narcotics; with a strict inculcation of mental and corporeal quietude—than in the mixed sedative and perturbing plan of management, which was at one time universal, and still lingers with many—of the older practitioners especially.

To one who has been taught, that the old method of management is essential, and who has employed no other, the success that attends this milder, and more soothing, and, as I would say, more philosophical, treatment may appear incredible. I can affirm, however, from the results of both public and private experience, that it is so generally successful, that a death from typhoid or bilious fever, is—to my observation—an uncommon event. The intelligent teacher, to whom I have just alluded, gives similar testimony in favour of a mode of management perhaps even less active than the one I have inculcated,—so far as regards the employment of local stimulants of the kind referred to. "Follicular enteritis," he says, "known more familiarly under the names of typhoid fever, typhoid remittent, and bilious fever, I find to be infinitely more manageable when treated with occasionally local depletion, as it may be indicated by local symptoms, the expectant method, and alterative doses, than by the perturbing and evacuant plan. Under this course, I rarely see it fatal."*

The antiphlogistic or sedative treatment is, doubtless, the main stay of the practitioner, in febrile maladies; but still, as we have seen under the proper heads, mild evacuants are necessary throughout the whole course of those diseases, and, when it becomes protracted,—upon the principle of revulsion, agents

* Art. 'Alteratives,' in Hays's 'Cyclopaedia.'

may be demanded, the propriety of whose use in the earlier periods of the disease might be more questionable.

In all cases of disease, the physician must investigate the nature of the pathological action going on in the tissues. This—as I have elsewhere remarked—must be the point of departure for his therapeutical indications; and a wise knowledge of the properties of his medicinal agents will enable him to carry into effect those indications:—but let him not vacillate. Let his therapeutics be guided by great general principles; and let him not fly from one indication to another, because the pathological condition may not be—or may not seem to be—yielding. If his principles be accurate, his indications will correspond; and if he be not satisfied with his indications, there can be but little safety for the patient, in the empiricism that must necessarily be the rule of conduct under such circumstances. It is an unfavourable index of the attainment of a physician, when he places undue store on some formula or agent, for the cure of particular pathological conditions. It is *prima facie* evidence of faulty observation, and of defective induction. It indicates a mind that searches after facts—too often ‘false’—rather than after great principles;—that is swayed by prepossessions rather than by true experience,—and that ought not to be trusted on trying or unusual occasions. To the possessor of such a mind, the advice to a young author,—if he had written any thing which he thought particularly fine, to strike it out,—might not be inappropriate. The loss of the result of the practitioner’s observation,—true or false, would be but trifling,—whilst the reception of a false fact, and its admission as a ground of action, might be most unfortunate.

The present is a period, eminently characterized for the accumulation of clinical observations, and much valuable information has been collected: yet, it is to be feared, the advantages, in this way obtained, have not been without countervailing results; and there are, perhaps, too many evidences of the minds of observers having been narrowed down to simple observation of occurrences, instead of being devoted to great general views. Facts have occupied the mind in the place of induction. The senses have been engaged, whilst the higher powers of the intellect have, too often, been permitted to remain dormant.

The periodical effusions of cases, with the *ex professo* treatises on medical clinics, are now so numerous and diversified, that the searcher after great principles of pathology and thera-

peutics scarcely knows at what point to commence his investigations. Were all the recorded 'facts' registered and detailed by observers of adequate talent and discrimination, the severity of the task would be greatly diminished; but, unhappily, this is not the case; and, hence, the difficulty, with the searcher after truth, is often extreme. If, indeed, we reflect on the multitude of cases, that have been published in the various periodical and other collections, and on the few—the very few—that are at this day alluded to as authorities on any point, we might have our medical ardour somewhat damped, and justly fear, that all our labour might be fruitless, and that, in a few short years, the results might be consigned to that oblivion, which has shrouded those of our predecessors. That many—I ought to say most—of the clinical cases, which have been the emanations of recent and present periods, will meet with this fate, is doubtless; but still, many must remain; and a spirit of accurate observation,—and of faithful registration of the results of such observation, emanating from distinguished teachers of the day, and ramifying amongst their pupils, in every quarter of the globe,—will persist, after they have passed away, and cannot fail to develop useful results. Facts are the foundation of all true theory—of all great principles of therapeutics—but such facts must be indubitable. The science of medicine has suffered greatly from the questionable and the false.

In an early part of this volume, I have remarked, that where the pathological lesion is understood, the therapeutical indication is clear; and, in general, easily fulfilled. No necessity will exist for complex combinations of different classes of medicinal agents; or of different agents of the same class. In every case, before prescribing, all agents should be rejected, whose *modus operandi* has not been well settled by careful, repeated, and unbiassed observation. It has been well remarked, "that a medicinal prescription should carry upon its very face an air of energy and decision, and speak intelligibly the indication, which it is to fulfil,—and that it may be laid down as a position, not in much danger of being controverted, that where the intention of a medical compound is obscure, its operation will be imbecile." There is, doubtless, truth, too, in the opinion entertained by some, that a practitioner's professional abilities may be estimated somewhat by the character of his prescription,—the scientific physician not permitting any agent to enter, without some satisfactory reason for its admission. Where no such reason can be adduced, there is usually some deficiency on the

part of the practitioner. What can the philosophic individual—professional or not—think of the reasoning—if reasoning it may be called—of the country practitioner, in England, who was celebrated for the complexity of the medicines which he gave to his patients,—a complexity, which was always, as might be expected, in a direct ratio with the obscurity of the cases? “If,” said he, “I fire a great profusion of shot, it is very extraordinary if some do not hit the mark,”—or of the subject of a similar anecdote, related by Sir Gilbert Blane,—who, being asked by his patient, why he put so many ingredients into his prescription, answered:—“in order that the disease may take that, which it likes best,”—a feeling, which would have readily enabled him to range himself under the ‘good men and true’ of Homœopathy, the believers in which maintain—as we have elsewhere seen—that there is a marked affinity between every disease and some article of the *materia medica*. Unlike, however, the practitioner in question, they endeavour to discover such agent; and administer it *alone*, in the disease for the removal of which it is considered to be specially adapted.

Where complexity is indulged, it is obviously impracticable to test, by any kind of experience, the properties of our therapeutical agents, or to discriminate the main sanative ingredient, from such as are of no efficacy, or may even counteract it.

Connected with this subject, Professor Bigelow, of Boston, has some judicious remarks, which strikingly exhibit the fallacious mode of reasoning, adopted by too many, in their investigation of disease, and of the proper adaptation of remedies. I do not think, indeed, that I can better terminate this subject—and, with it, the volume—than by citing the following passages from his essay.

“The foundation of all knowledge is truth. For truth, then, we must earnestly seek, even when its developments do not flatter our professional pride, nor attest the infallibility of our art. To discover truth in science is often extremely difficult; in no science is it more difficult than in medicine. Independently of the common defects of medical evidence, our self-interest, our self-esteem, and sometimes even our feelings of humanity, may be arranged against the truth. It is difficult to view the operations of nature, divested of the interferences of art, so much do our habits and partialities incline us to neglect the former, and to exaggerate the importance of the latter. The mass of medical testimony is always on the side of art. Medical books are prompt to point out the cure of diseases. The

young student goes forth into the world, believing that if he does not cure diseases, it is his own fault. Yet when a score or two of years have passed over his head, he will come at length to the conviction, that some diseases are controlled by nature alone. He will often pause at the end of a long and anxious attendance, and ask himself, how far the result of the case is different from what it would have been under less officious treatment than that which he has pursued; how many in the accumulated array of remedies, which have supplanted each other in the patient's chamber, have actually been instrumental in doing him any good. He will also ask himself, whether in the course of his life, he has not had occasion to change his opinion, perhaps more than once, in regard to the management of the disease in question, and whether he does not, even now, feel the want of additional light? * * * We are seldom justified in concluding, that our remedies have promoted the cure of a disease, until we know, that cases, exactly similar in time, place, and circumstances, have failed to do equally well under the omission of those remedies; and such cases, moreover, must exist in sufficient numbers to justify the admission of a general law on their basis. Nothing can be more illogical, than to draw our general conclusions, as we are sometimes too apt to do, from the results of insulated and remarkable cases; for such cases may be found in support of any extravagance in medicine; and if there is any point in which the vulgar differ from the judicious part of the profession, it is in drawing premature and sweeping conclusions, from scanty premises of this kind. Moreover, it is in many cases not less illogical to attribute the removal of diseases, or even of their troublesome symptoms, to the means which have been most recently employed. It is a common error to infer that things, which are consecutive in the order of time, have necessarily the relation of cause and effect. It often happens that the last remedy used bears off the credit of having removed an obstruction, or cured a disease, whereas in fact the result may have been owing to the first remedy employed, or to the act of nature uninfluenced by any of the remedies. * * * In the study of experimental philosophy, we rarely admit a conclusion to be true, until its opposite has been proved to be untrue. But in medicine we are often obliged to be content to accept as evidence the results of cases, which have been finished under treatment, because we have not the opportunity to know how far these results would have been different, had the cases been left to themselves. And it too frequently happens, that medical books do

not relieve our difficulties on this score, for a great deal of our practical literature consists in reports of interesting, extraordinary, and successful results, published by men who have a doctrine to establish, or a reputation to build. "Few authors," says Andral, "have published all the cases they have observed, and the greater part have only taken the trouble to present to us those facts, which favour their own views." A prevailing error among writers on therapeutics proceeds from their professional, or personal, reluctance to admit that the healing art, as practised by them, is not, or may not be, all sufficient in all cases: so that on this subject they suffer themselves, as well as their readers, to be deceived.—Hence we have no disease, however intractable or fatal, for which the press has not poured forth its asserted remedies. * * * It is only when, in connexion with these flattering exhibitions, we have a full and faithful report of the failures of medical practice, in similar, and in common cases, setting forth not only the truth, but the whole truth, that we have a basis sufficiently broad to erect a superstructure in therapeutics, on which dependence may be placed."

* 'A discourse on self-limited diseases, delivered before the Massachusetts Medical Society, at the annual meeting, May 27, 1835.' Boston, 1835, p. 31.

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